LAMBDA-CYHALOTHRIN (146)

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EXPLANATION

Lambda-cyhalothrin is being evaluated as a new active substance intended as a replacement for cyhalothrin. Lambda-cyhalothrin is an enriched isomeric form of the two biologically active diastereoisomeric pairs of isomers of cyhalothrin. It is mainly used for plant protection purposes as a non-systemic broad spectrum insecticide in a wide range of crops worldwide.

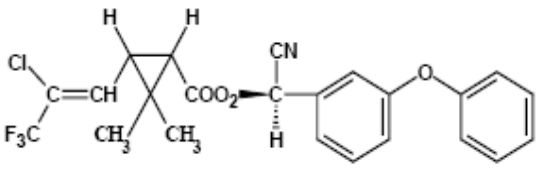
Data to support the uses reported and which are required for the estimation of MRLs have been provided by the company.

The governments of Australia, Japan and Thailand have submitted national GAP and residue information.

IDENTITY

ISO common name	**lambda-cyhalothrin (draft E-ISO)** **lambda-cyhalothrine (draft F-ISO)**
IUPAC	**1:1 mixture of (S)-α-cyano-3-phenoxybenzyl-(Z)-(1R,3R)-3-(2-chloro-3,3,3-trifluoroprop-1-enyl) -2,2-dimethylcyclopropane carboxylate and(R)-α-cyano-3-phenoxybenzyl (Z)-(1S,3S)-3-(2-chloro-3,3,3-trifluoroprop-1-enyl) -2,2-dimethylcyclopropane carboxylate**
CA	**[1-α(S*),3α(Z)]-(±)-cyano(3-phenoxyphenyl)methyl-3-(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclopropanecarboxylate (9CI)**
CIPAC No	**463**
CAS No	**[91465-08-6]**
FAO Specification	**For lambda-cyhalothrin as well as for the formulation presented in Table 3 pesticide specifications were established through the Joint FAO/WHO Meetings on Pesticide Specifications (JMPS) and published as FAO Specifications and Evaluations for Agricultural Pesticides compounds in 2004 (http://www.fao.org/ag/agp/agpp/Pesticid/Default.htm).**
Molecular formula	**$C_{25}H_{19}ClF_3NO_3$**
Molecular mass	**449.9 g/mol**

Structural formula



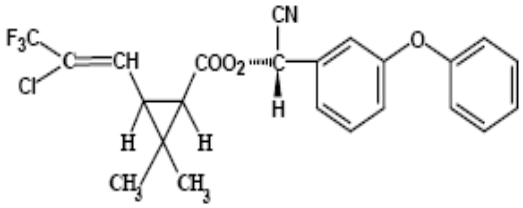


Figure 1 lambda-cyhalothrin (R) (Z)-(1S)-cis-isomer Figure 2 lambda-cyhalothrin (S)-(Z)-(1R)-cis-isomer

PHYSICAL AND CHEMICAL PROPERTIES

Table 1 Physical and chemical properties

Property	Results	Method (test material)	Reference
Melting point		OECD 102	
	49.2 °C (322.4 K)	(pure active substance)	Wollerton, 1984
	47.5–48.5 °C (320.6-321.6 K)	(technical active substance)	
Boiling point		OECD 103	
	No boiling point at atmospheric pressure.	(pure active substance)	Wollerton, 1984
	No boiling point at atmospheric or reduced pressure.	(technical active substance)	Wollerton, 1984
	A true atmospheric pressure boiling point cannot be measured.	(technical active substance)	Jackson, 1994
Temperature of decomposition or sublimation	Decomposition occurs at approx. 275 °C.	(pure active substance)	Wollerton, 1984
	Decomposition occurs at approx. 239 °C at 1 mm Hg pressure.	(technical active substance)	Wollerton, 1984
	The test substance decomposes at < 270 °C and a true atmospheric pressure boiling point cannot be measured.	(technical active substance)	Jackson, 1994
Relative density		OECD 109	
	1.33 g/cm^3 (1330 kg/m^3)	(technical active substance)	Wollerton, 1984
	The relative density of current technical *lambda*-cyhalothrin is 1.288 g/cm^3 (n = 2)	(technical active substance)	Jackson, 1994
Vapour pressure		OECD 104	
	Vapour pressure at 20 °C: 2×10^{-10} kPa (extrapolated)	(pure active substance)	Wollerton, 1984
Volatility	Henry's law constant: 2×10^{-2} Pa m^3/mol.	(pure active substance)	Wollerton, 1984
Physical state and colour	Pure active substance: white solid	(pure active substance)	Wollerton, 1984
	Technical grade active substance : beige solid	(technical active substance)	
	Current technical material (min. purity 81%): green/brown liquid	(current technical active substance)	
Odour	Pure active substance: odourless	(pure active substance)	Wollerton, 1984
	Technical grade active substance : odourless	(technical active substance)	
	Current technical material (min. purity 81%): odourless	(current technical active substance)	
Spectra active substance		OECD 101	Wollerton, 1984
	UV / IR/ NMR / mass spectra	(pure active substance)	
	UV Absorption Characteristics : Molar extinction coefficients (ε, L/mol.cm) were determined to be: wavelength (nm) ε (L/mol.cm) 254 1090 277 2070 Some absorption has been observed above 290 nm.	UV / VIS	
	NMR spectra of associated isomers	(technical active substance)	Tandy *et al*., 1988
Solubility in water including effect of pH	Solubility in water at 20 °C: pH 5: 4×10^{-3} mg/L pH 6.5: 5×10^{-3} mg/L pH 9.2: 4×10^{-3} mg/L	NBS Method (pure active substance and technical active substance)	Wollerton, 1984
Solubility in organic solvents	Solubility in acetone, dichloromethane, ethyl acetate, hexane, toluene and methanol solvents at 21 °C: > 500 g/L	(technical active substance)	Wollerton, 1984
Partition coefficient n-octanol / water	log $K_{ow:}$ 7.0	NBS Method (pure active substance)	Wollerton, 1984
Hydrolysis rate	pH 5.2 stable pH 6.9 stable pH 9.0 after 7 days 43-45% of lambda-cyhalothrin remains intact indicating.	(pure active substance)	Collis & Leahey, 1984

Property	Results	Method (test material)	Reference
Photochemical degradation	Photolysis studies on *lambda*-cyhalothrin were conducted at pH 5 for 31 days at 25 °C. The results give about 50% degradation as 24 days. (this value can only be an approximation because *lambda*-cyhalothrin is so hydrophobic that it does not remain totally in solution during the irradiation)	(pure active substance)	Priestley & Leahey, 1988
Quantum yield	The quantum yield of direct photolysis was found to be Φ = 0.092 (at wavelengths 270 - 290 nm, acetonitrile, 20 °C) Photolytic half-life obtained in 5 cm to 30 cm depth of water for the four seasons in mid Europe: DT50 (days) – 5 cm / DT50 (days) – 30 cm Spring 3.6 / 5.8 summer 0.7 / 5.3 autumn 3.3 / 8.2 winter 31 / 75 Indicated DT50 in water: 13 days at the geographical latitudes of 40°N and 50°N.	Methodology equivalent to ECETOC Guideline of GFEA: "Phototransformation of Chemicals in Water; Part A : Direct Phototransformation", Berlin, FRG, January 1990" (Frank & Klöppfer - method) (pure active substance)	Moffatt, 1994
Dissociation constant	Not applicable (no dissociation in water)	by estimation (pure active substance)	Wollerton, 1984

Hydrolysis of lambda-cyhalothrin

Hydrolysis studies were carried out by Collis (1984) on [cyclopropyl-^{14}C]lambda-cyhalothrin, in the dark, at 25 °C, over a period of 30 days and at pH 5, 7 and 9. The applied radioactivity did not remain completely in any pH solution tested, since lambda-cyhalothrin is an extremely hydrophobic compound. It was therefore necessary to extract the aqueous solutions and the glass vessels containing these solutions with dichloromethane in order to recover most of the applied radioactivity.

The results indicated that lambda-cyhalothrin is stable to hydrolysis at pH 5, hydrolyses very slowly at pH 7 and rapidly at pH 9. An estimate of the half-life in water, at pH 7 and 9, was obtained by linear regression analysis: the half-lives are 453 days at pH 7 and 7.3 days at pH 9.

At both pH 7 and 9, the cyclopropane acid (compound Ia) was the major product of hydrolysis (2% at pH 7 and 73% at pH 9). Polar compounds, which remained at the origin of thin layer chromatograms, were also formed, but were always less than 10% of the radioactivity extracted using dichloromethane.

Hydrolysis studies were carried out on [benzyl-^{14}C]cypermethrin by Leahey (1980), in the dark, at 25 °C, over a period of 30 days and at pH 4, 7 and 9. Hydrolysis occurred very slowly at pH 4, slowly at pH 7 and fairly rapidly at pH 9. At all pHs, compounds IV and V were formed, with compound IV being the major compound formed (at pH 9 up to 78% of the applied radioactivity). Trace amounts of compound III were also detected at pH 4 and 7. Two unidentified compounds were also formed, these two compounds representing 10.7% and 3.4% of the applied radioactivity after 29 days at pH 9. These unknowns occurred at much lower levels at pH 4 and 7.

Aqueous hydrolysis was investigated by Richardson (2006) on [phenyl-^{14}C] and [cyclopropane-^{14}C]lambda-cyhalothrin in acetate buffers at pH 4,5 and 6. [^{14}C]lambda-cyhalothrin showed little degradation in buffer at pH 4 when heated to 90 °C for 20 minutes and at pH 5 when heated to 100 °C for 60 minutes. A high degree of degradation was seen in pH 6 buffer heated to 120 °C. Characterisation and identification of the residues showed that lambda-cyhalothrin and the cyhalothrin enantiomeric pair A (82.6–90.5% of total radioactive residue (TRR)) were the main components after hydrolysis at elevated temperatures and pH 4 and 5. Minor amounts of compound IV (2.0–2.4% TRR), V (0.8–1.2% TRR) and Ia (3.7–4.5% TRR) were identified as shown in Table 2.

A much greater degree of hydrolytic cleavage was seen in the pH 6 hydrolysates at 120 °C. The major component in the extract from the [phenyl-^{14}C]lambda-cyhalothrin experiment was compound Ia (63.7% TRR). Lambda-cyhalothrin and the cyhalothrin enantiomeric pair A accounted for 18.5% TRR.

Table 2 Maximum amounts of [^{14}C]lambda-cyhalothrin and degradation products after hydrolysis

Compound No.	% Total Radioactive Residue					
	pH 4, 90 °C, 20 min		pH 5, 100 °C, 60 min		pH 6,120 °C, 20 min	
	[^{14}C-phenyl]-	[^{14}C-cyclopropyl]-	[^{14}C-phenyl]-	[^{14}C-cyclopropyl]-	[^{14}C-phenyl]-	[^{14}C-cyclopropyl]-
lambda–Cyhalothrin [a]	87.8	90.5	86.3	82.6	18.5	7.8
compound IV	2.0	ND	2.4	ND	63.7	ND
compound V	0.8	ND	1.2	ND	1.9	ND
compound Ia	ND	4.5	ND	3.7	ND	59.2
CSCD113175	ND	ND	ND	ND	ND	14.6
Unknowns	0.6	0.3	1.3	0.8	4.3	4.0

a Sum of lambda-cyhalothrin and cyhalothrin enantiomeric pair A

CSCD113175 γ-lactone,4-(1-chloro-2,2,2-trifluoro-ethyl)-6,6-dimethyl-3-oxa-bicyclo[3.1.0]hexane-2-one

Formulations

Currently registered formulations containing lambda-cyhalothrin are shown in Table 3.

Table 3 Registered lambda-cyhalothrin based formulations

Formulation	ai/Formulation Type/Composition*
Demand CS insecticide (Grenade er insecticide)	EC (9.7%)
Demand EZ insecticide	EC (2.43%)
Demand Pestab insecticide	Pelleted/ tabletted (10%)
Impasse Premix GR	Intermediate formulation (3.2%)
Impasse Termite Blocker	Impregnated materials (0.77%)
Impasse Termite System	RTU 0.77% (ready-to-use)
Karate CSO Insecticide	EC (7.8%)
Karate Insecticide	EC (13.1%)
Karate Insecticide with Zeon Technology	EC (22.8%)
Lambda-Cy 0.045% H&G Granule Insecticide	WG (0.05%)
Lambda-cyhalothrin 250 CS MUP	Intermediate formulation (22.8%)
Lambda-cyhalothrin TC Insecticide	EC (13.1%)
Scimitar CS Insecticide	EC (9.7%)
Scimitar WP Insecticide in Water-Soluble Packs	Water soluble packaging (10%)
Warrior LEC	EC (12.6%)

EC -emulsion concentrate; WG -wettable granule;

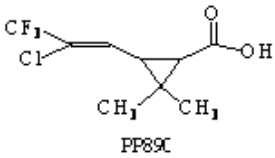
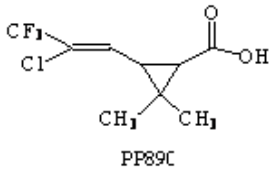
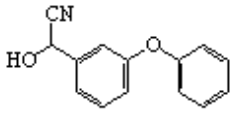
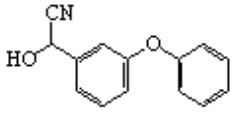
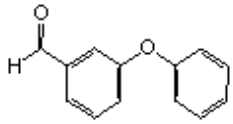
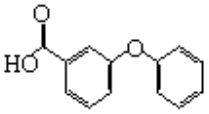
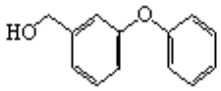
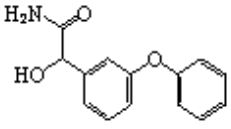
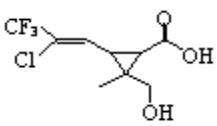
* w/w or g ai/L formulation, w/v for solid and liquid formulations respectively

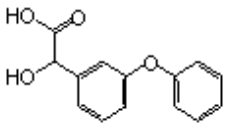
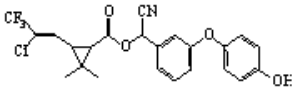
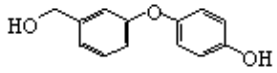
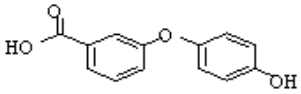
METABOLISM AND ENVIROMENTAL FATE

Chemical names, structures and code names of metabolites and degradation products of lambda-cyhalothrin are shown below.

Table 4 Known metabolites of lambda-cyhalothrin

Code Number	Description/Denomination (IUPAC Name)	Study metabolite identified in	Structure

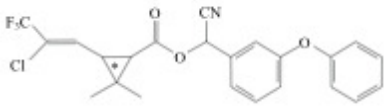
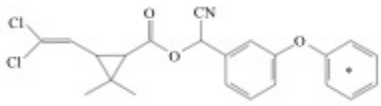
Code Number	Description/Denomination (IUPAC Name)	Study metabolite identified in	Structure
Compound Ia, PP890, TFMCVA, cyclopropane acid	(Z)-3-(2-chloro-3,3,3-trifluoro-propenyl)-2,2-dimethylcyclo-propane carboxylic acid	Plant Metabolism Animal Metabolism Soil Metabolism Aqueous Photolysis, Hydrolysis Water-Sediment Dissipation	
Compound Ib, R171403	(1RS)-trans-3-(2-chloro-3,3,3-trifluoropropenyl)-2,2-dimethyl-cyclopropane carboxylic acid	Plant Metabolism Aqueous Photolysis	
Compound II	(RS)-α-amido-3-phenoxybenzyl-(1RS)-cis-3-(2-chloro-3,3,3-tri-fluoropropenyl)-2,2-dimethyl-cyclopropane carboxylate	Soil Photolysis	
Compound III	(RS)-α -cyano-3-phenoxy-benzyl alcohol	Plant Metabolism Aqueous Hydrolysis	
Compound IV, R110649	3-phenoxybenzaldehyde	Plant Metabolism Soil Metabolism Soil Photolysis Aqueous Photolysis	
Compound V, R41207, 3PBA	3-phenoxybenzoic acid	Plant Metabolism Animal Metabolism Soil Metabolism Soil Photolysis Aqueous Photolysis Water-Sediment Dissipation	
Compound VI, R79406	3-phenoxybenzyl alcohol	Plant Metabolism Water-Sediment Dissipation	
Compound IX	(RS)-3-phenoxymandelamide	Plant Metabolism	
Compound XI, R173948	3-(2-chloro-3,3,3-trifluoro-prop-1-enyl)-2-hydroxy-methyl-2-methyl-cyclopropane carboxylic acid	Plant Metabolism Animal Metabolism	

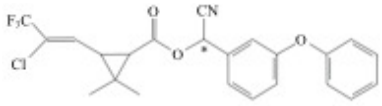
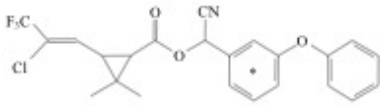
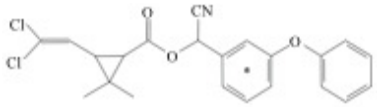
Code Number	Description/Denomination (IUPAC Name)	Study metabolite identified in	Structure
Compound XIII	(RS)-3-phenoxymandelic acid	Plant Metabolism	
Compound XV	(RS)-α -cyano-3-(4-hydroxy-phenoxy)benzyl (Z)-(1RS)-cis-3-(2-chloro-3,3,3-trifluoro-propenyl)-2,2-dimethyl-cyclopropane carboxylate	Soil Metabolism Water-Sediment Dissipation	
Compound XIX, R231173	3-(4-hydroxyphenoxy)benzyl alcohol	Plant Metabolism	
Compound XXIII, R175447, (4-OH-3PBA)	3-(4'-hydroxy)-phenoxy-benzoic acid	Animal Metabolism Soil Metabolism	

Lambda-cyhalothrin is a synthetic pyrethroid insecticide. It consists of two of the four enantiomers which constitute cyhalothrin. Cyhalothrin comprises approximately 50% lambda-cyhalothrin (cis 1RαS and cis 1SαR enantiomers, enantiomeric pair B) and 50% R157836 (cis 1RαR and cis 1SαS enantiomers, enantiomeric pair A).

For the following metabolism studies various ^{14}C-labelled test materials were used. Radiolabelling in the cyclopropane ring is used for tracing the 'acid moiety', while radiolabelling in the phenyl or benzyl ring is used for tracing the 'alcohol moiety'.

Table 5 Positions of ^{14}C-labels in lambda-cyhalothrin used for metabolism studies

Name	Properties	Chemical structure
[cyclopropyl-^{14}C]lambda-cyhalothrin (PP321)	Specific activity: Goat metabolism: ca. 4.45 MBq/mg (ca. 120.2 µCi/mg) Hens metabolism: ca. 4.9 Mbq/mol Wheat metabolism: ca. 3.07 Mbq/mg Soya metabolism: ca. 4.29 Mbq/mg Cotton metabolism:ca. 4.29 Mbq/mg Rotational crops: ca. 1.94 MBq/mg Radiochemical purity: Goat metabolism > 99% Hens metabolism > 99% Rat metabolism: > 98% Wheat metabolism: > 98% Soya metabolism: 98% Cotton metabolism: 98% Rotational crops: > 95%	 * = Position of ^{14}C-label
[phenoxy-^{14}C]-cypermethrin	Specific activity: Hen metabolism: 0.833 MBq/mg (22.5 µCi/mg) [a] Wheat metabolism: ca. 4.49 Mbq/mg Rotational crops: ca. 2.22 MBq/mg Radiochemical purity:	 * = Position of ^{14}C-label

Name	Properties	Chemical structure
	Hen metabolism: > 99% [b] Wheat metabolism: > 98% Rotational crops: > 96%	
[benzyl-^{14}C]lambda-cyhalothrin (PP321) and [benzyl-(U)-^{14}C]lambda-cyhalothrin (PP321)	Specific activity: Soya metabolism: 5.01 MBq/mg Cotton metabolism: 5.01 Mbq/mg Radiochemical purity: Soya metabolism: 98% Cotton metabolism: 98%	 [benzyl]-14C-benzyl-labelled cyhalothrin  [benzyl-(U)-14C]- cyhalothrin
[benzyl-^{14}C]-cypermethrin	Specific activity: Cow metabolism: 1.13 MBq/mg (30.4 µCi/mg)[a] Radiochemical purity: Cow metabolism: > 99% [c]	 * = Position of ^{14}C-label

[a] before purification

[b] after purification cis:trans ratio 55:45

[c] after purification cis:trans ratio 46:54

Animal Metabolism

The Meeting received animal metabolism studies with lambda-cyhalothrin in rats, hens and lactating goats.

Since most of these studies were conducted with labelling of the acid-moiety only, supplemental studies using cypermethrin were submitted. The alcohol-moiety of cypermethrin is comparable to lambda-cyhalothrin although the log K_{OW} (5.3–5.6) is slightly lower. Corresponding to lambda-cyhalothrin the cleavage of the ester bond is the first metabolism step resulting in the comparable alcohol-moiety metabolite compound III, which follows a similar pathway.

Lambda-cyhalothrin is cleaved at the ester bond as the first metabolic step followed by hydroxylation at various sides of both breakdown products. In general these products are further conjugated with sulfate or glucose and excreted via the urine.

Rats

Rat metabolism studies were evaluated by the WHO Core Assessment Group of the 2007 JMPR. In this section only a short summary of the results is presented.

In rats oral doses of cyhalothrin were readily but incompletely absorbed (30–40% of radiolabel was recovered in urine). At a low dose, most (70%) of the administered material was excreted in the faeces and urine within 24h. After 7 days, 2–3% of the cyhalothrin administered persisted as unchanged residue in fat. Metabolism in rats involved initial cleavage of the molecule at the ester bond. In rats dosed with cyhalothrin, major metabolites identified in urine were the sulfate conjugate of compound XXIII and glucuronide conjugate of compound Ia. Minor metabolites identified were unconjugated compound XXIII and compound V.

Lactating goats

Metabolism in a goat (tracing the acid moiety) was investigated by Leahey, French and Heath (1985). A lactating goat was dosed with [cyclopropyl-^{14}C]lambda-cyhalothrin at a rate equivalent to approximately 10.8 mg/kg in its total diet. The dose was administered twice daily (in gelatine

capsules) at each milking. Dosing was continued for seven days and the goat was sacrificed 16 h after the final dose. Milk, urine and faeces were collected throughout the dosing period and samples of meat, fat, liver and kidney were taken at sacrifice.

The samples were extracted using acetonitrile. Identification and quantification was achieved with TLC and HPLC analysis. For liver and kidney subsequent partitioning using hexane and dichloromethane was performed for characterisation and identification purposes. Residual solids were released by acid hydrolysis and subsequent TLC.

At sacrifice, 71% of the total radioactivity administered had been excreted (faeces 29.3% of Total Radioactive Residues (TRR), urine 41.7% of TRR).

The TRR in the milk, collected throughout the dosing period, reached a maximum level of 0.27 mg/kg after five days. Most of the residue in the milk (> 95%) was identified as lambda-cyhalothrin. Further identification or characterisation of the remaining radioactivity was not performed.

TRR found in the edible tissues of the goat ranged from 0.024 mg/kg in muscle up to 0.44 mg/kg in fat. An overview of the residues found is presented in Table 6.

Table 6 Total radioactive residues in edible tissues of a goat treated with two daily applications of [cyclopropyl-^{14}C]lambda-cyhalothrin at 10.8 mg/kg total diet

Edible tissues	TRR [mg/kg]
Forequarter muscle	0.028
Hindquarter muscle	0.024
Mixed muscle sample used for residue characterisation	0.03
Subcutaneous fat	0.13
Omental fat	0.33
Perirenal fat	0.44
Mixed fat sample used for residue characterisation	0.32
Liver	0.34
Kidney	0.20

In meat and fat tissues most of the residue consisted of unchanged parent compound accounting for 0.028 mg/kg (93.8% TRR) and 0.28 mg/kg (88.7% TRR) respectively. Additional metabolites could not be identified. The results are summarised in Tables 7 and 8.

Table 7 Radioactive residues in meat from a goat treated with two daily applications of [cyclopropyl-^{14}C]lambda-cyhalothrin

Analytes in meat	Radioactivity [%]	Residue [mg/kg]
lambda-cyhalothrin	93.8	0.028
Unextracted	6.2	0.002

Table 8 Radioactive residues in fat from a goat treated with two daily applications of [cyclopropyl-^{14}C]lambda-cyhalothrin

Analytes in fat	Radioactivity [%]	Residue [mg/kg]
lambda-cyhalothrin	88.7	0.28
4 Characterised compounds	9.9	0.032
Unextracted	1.4	0.004

In the liver more complete metabolism of the active compound was observed (see Table 9). The main metabolite was identified as compound Ia (0.07 mg/kg or 20% TRR), followed by compound XI (0.015–0.036 mg/kg, 4.3–10.4% TRR). Lambda-cyhalothrin was found at levels of 0.022 mg/kg (6.3% TRR). The remainder of the liver residue consisted of organo-soluble fractions which were analytically-intractable (10.8% TRR, 0.038 mg/kg), water-soluble radioactivity remaining after acid hydrolysis (21.5% TRR, 0.075 mg/kg) with losses during preparation of samples amounting to 1.1% TRR (0.004 mg/kg).

Table 9 Radioactive residues in liver from a goat treated with two daily applications of [cyclopropyl-^{14}C]lambda-cyhalothrin

Analytes in liver	Radioactivity range [%]	Residue [mg/kg]
lambda-cyhalothrin	6.3	0.022
compound Ia	20.0	0.070
compound XI	4.3-10.4	0.015-0.036
5 Characterised compounds	1.8	0.006
Organo-soluble polar compounds	6.1-7.8	0.02-0.03
Unextracted	4.8	0.017

In kidney (see Table 10) compound Ia was the primary residue found at levels of 0.099–0.11 mg/kg (49.5–54% TRR). Compound XI and unchanged lambda-cyhalothrin were identified as minor metabolites only account at 0.011–0.012 mg/kg (5.3–6% TRR) and 0.005 mg/kg (2.4% TRR), respectively. The remainder of the kidney residue consisted of an organo-soluble fraction (2.2–2.6% TRR, < 0.001–0.001 mg/kg) and a water-soluble fraction remaining after acid hydrolysis (5.8% TRR, 0.011 mg/kg), with losses during preparation of samples for analysis of (8.0–17.5% TRR, 0.016–0.035 mg/kg).

Table 10 Radioactive residues in kidney from a goat treated with two daily applications of [cyclopropyl-^{14}C]lambda-cyhalothrin

Analytes in kidney	Radioactivity range [%]	Residue [mg/kg]
lambda-cyhalothrin	2.4	0.005
compound Ia	49.5–54.0	0.099–0.108
compound XI	5.3–6.0	0.011–0.012
Organo-soluble polar compounds	1.3–4.7	0.003–0.009
Unextracted	4.6	0.009

Laying hens

Metabolism in laying hens (tracing the acid moiety) was investigated by Heath and Leahey (1985). Two laying hens were dosed with [cyclopropyl-^{14}C]lambda-cyhalothrin at a rate equivalent to 10.8 mg/kg of total diet. The dose was administered once daily for 14 days and the hens were sacrificed 24 h after the final dose. Eggs and excreta were collected throughout the dosing period and samples of meat, liver and fat were taken at sacrifice.

The samples were extracted using acetonitrile. Identification and quantification was achieved with TLC and HPLC analysis. Residual solids were released by acid hydrolysis and subsequent TLC. The TRRs found in hens tissues are presented in Table 11

Table 11 TRR in edible tissues from hens treated with one daily application of [cyclopropyl-^{14}C]lambda-cyhalothrin

Edible tissues	TRR range [mg/kg]
Breast muscle	< 0.01-0.01
Leg muscle	< 0.01-0.01
Liver	0.36-0.60
Fat	0.17-0.46

At sacrifice, 24 h after the final dose, 98% and 100% of the administered doses were recovered in the excreta of the two hens.

Radioactive residues in the egg yolks reached a maximum level of 0.32 mg/kg after seven days. The residues in the albumen never exceeded 0.01 mg/kg. The very low residue in the albumen was not characterised, however the residue in the yolk was characterised as shown in Table 12.

Table 12 Radioactive residues in yolk from hens treated with one daily application of [cyclopropyl-^{14}C]lambda-cyhalothrin at 10.8 mg/kg total diet

Analytes in yolk	Radioactivity [%]	Residue [mg/kg]
lambda-cyhalothrin	60.9	0.146
1 unidentified compound	7.4	0.018
Polar compounds	1.4	0.003
Hexane soluble radioactivity	9.1	0.022
Unextracted radioactivity	12.6	0.030
Losses during preparation of samples for analysis	7.1	0.017

In muscle very low residues were found which did not permit identification or characterisation.

The results obtained from the liver of laying hens (see Table 13) indicate significant metabolism of the active substance as no lambda-cyhalothrin was found. The main residue was identified as compound Ia with 0.22 mg/kg (51% TRR), one of the cleavage products of the ester bond. As a minor metabolite compound XI could be identified and quantified (0.046 mg/kg; 10% TRR). Acid hydrolysis of the unextractable residues (0.082 mg/kg; 20% TRR) indicated a small amount of organo-soluble radioactivity with trace amounts of compounds Ia and XI.

Table 13 Radioactive residues in liver from hens treated with one daily application of [cyclopropyl-^{14}C]lambda-cyhalothrin

Analytes in liver	Radioactivity [%]	Residue [mg/kg]
lambda-cyhalothrin	Not detected	Not detected
compound Ia	51.3	0.215
compound XI	9.5	0.040
2 Unidentified compounds	10.0	0.046
Polar compounds	8.4	0.035
Unextracted	19.6[a]	0.082

[a] Reflux in 2M-hydrochloric acid solubilised 63% of this radioactivity, but only a small amount of this extracted radioactivity was organo-soluble (3.3% of the total liver residue). Trace amounts of compound Ia (0.6% of the total residue) and compound XI (1.3% of the total residue) were detected in this organo-soluble fraction.

In fat only minor biotransformation of the active substance was observed. More than 80% of the TRR (0.22 mg/kg) was identified as lambda-cyhalothrin. Further fractions accounted for < 10% of the TRR each. The results for kidneys of laying hens are presented in Table 14.

Table 14 Radioactive residues in fat from hens treated with one daily application of [cyclopropyl-^{14}C]lambda-cyhalothrin

Analytes in kidney	Radioactivity [%]	Residue [mg/kg]
lambda-cyhalothrin	80.1	0.224
1 Unidentified compound	8.8	0.025
Polar compounds	2.8	0.008
Unextracted	6.5	0.018
Losses during preparation of samples for analysis	0.8	0.002

Cows (conducted with cypermethrin)

Metabolism in a cow (tracing the alcohol moiety) was investigated by Hutson (1980). A lactating cow was dosed with [benzyl-^{14}C]-cypermethrin at a rate equivalent to approximately 10.0 mg/kg of total diet. The dose was administered twice daily (absorbed to the animals feed) at each milking. Dosing was continued for seven days and the cow was sacrificed 16 h after the final dose. Milk, urine and faeces were collected throughout the dosing period and samples of meat, fat, liver and kidney were taken at sacrifice.

Identification and characterisation of the radioactive residues was achieved by TLC with HPLC as confirmation method. For quantification purposes radio detection was used in combination with HPLC and GC. The total radioactive residues in the edible tissues of the cow are summarised in Table 15. At sacrifice, 93% of the radioactivity administered had been excreted (faeces 44.1%, urine 46.0%, pen washings 2.7%).

Table 15 Total radioactive residues in edible tissues of a cow treated with two daily applications of [benzyl-^{14}C]-cypermethrin at 10.1 mg/kg total diet

Edible tissues	TRR [mg/kg]
Muscle	0.01
Perirenal fat	0.10
Subcutaneous fat	0.08
Liver	0.21
Kidney	0.11

The total radioactive residues in the milk, collected throughout the dosing period reached a maximum level of 0.031 mg/kg after seven days. Approximately 90% of the milk residue was identified as cypermethrin. Significant levels of metabolites from the alcohol moiety were not detected in the milk.

The very low residues in muscle was not identified or characterised. In fat parent cypermethrin was the only residue which could be identified in amounts of 80% TRR. Liver and kidney showed more pronounced metabolism (see Tables 16 and Table 17). The metabolite was identified as compound V at a level of 56% and 59% of the TRR respectively. Compound XXIII, the hydroxylation product of compound V, was found at a level of 16% of the TRR in liver and at 3.6% of the TRR in kidney.

Table 16 Radioactive residues in liver from a cow treated with two daily applications of [benzyl-^{14}C]cypermethrin

Analytes in liver	Radioactivity [%]	Residue [mg/kg]
Cypermethrin	4.8	0.010
Compound V*	56.2	0.118
Compound XXIII	16.2	0.034
3 Characterised compounds	9.5	0.020
Polar compounds	5.2	0.011
Water soluble radioactivity	4.0	0.008
Unextracted	2.5	0.005

Table 17 Radioactive residues in kidney from a cow treated with two daily applications of [benzyl-^{14}C]cypermethrin

Analytes in kidney	Radioactivity [%]	Residue [mg/kg]
Cypermethrin	0.7	0.001
Compound V*	59.3	0.083

Analytes in kidney	Radioactivity [%]	Residue [mg/kg]
Compound XXIII	3.6	0.005
Unidentified compounds	4.3	0.006
Polar compound	16.4	0.023
Water soluble radioactivity	8.3	0.012
Unextracted	8.0	0.011

Laying hens (conducted with cypermethrin)

Metabolism in laying hens (tracing the alcohol moiety) was investigated by Hutson (1982). Four laying hens were dosed with [phenoxy-^{14}C]-labelled cypermethrin at a rate equivalent to approximately 10.0 mg/kg in the total diet (1.52 mg per bird and day). The dose was administered once daily for 14 days and the hens were sacrificed 4.5 hours after the final dose. Eggs and excreta were collected throughout the dosing period and samples of meat, liver and fat were taken at sacrifice.

For the analysis of the radioactive residues in the samples TLC and HPLC were used for quantification and identification. The total radioactive residues in the edible tissues of the hen are summarised in Table 18. At sacrifice, 90.9%, 96.4%, 99.5% and 94.1% of the administered doses was recovered in the excreta of the four hens.

Table 18 TRR in edible tissues from hens treated with one daily application of [phenoxy-^{14}C]-cypermethrin

Edible tissues	TRR range [mg/kg]
Breast muscle	0.009–0.014
Leg muscle	0.015–0.025
Liver	0.32–0.41
Fat (peritoneal)	0.06–0.11
Fat (subcutaneous)	0.06–0.10

Radioactive residues in the egg yolks reached a maximum level of 0.19 mg/kg after nine days. The residues in the albumen never exceeded 0.01 mg/kg. Although the very low residue in the albumen was not characterised, however, the residue in the yolk was characterised as shown in Table 19.

Table 19 Radioactive residues in yolk from hens treated with one daily application of [phenoxy-^{14}C]cypermethrin

Analytes in yolk	Radioactivity[%]	Residue [mg/kg]
Cypermethrin	30.0	0.046
Compound V	1.2	0.002
4-Hydroxy-cypermethrin	0.4	< 0.001
Hexane soluble radioactivity [a]	59.2	0.091
Unextracted	1.4	0.002

[a] This radioactivity did not partition from hexane into acetonitrile, establishing that it was not cypermethrin. The radioactivity was inseparable from the natural lipids present in egg yolk.

The very low residues in muscle were not further investigated. For liver and kidney most of the residue identified consisted of unchanged cypermethrin. Only in liver minor amounts of cleavage products compound V and XIII were found. The results for liver and fat are summarised in Table 20 and Table 21.

Table 20 Radioactive residues in liver from hens treated with one daily application of [phenoxy-^{14}C]-cypermethrin

Analytes in liver	Radioactivity [%]	Residue [mg/kg]
Cypermethrin	16.3	0.060
Compound V	4.1	0.015
Compound XXIII	3.5	0.013

Table 21 Radioactive residues in fat from hens treated with one daily application of [phenoxy-^{14}C]-cypermethrin

Analytes in fat	Radioactivity [%]	Residue [mg/kg]
Cypermethrin	56.2-59	0.0047 - 0.049

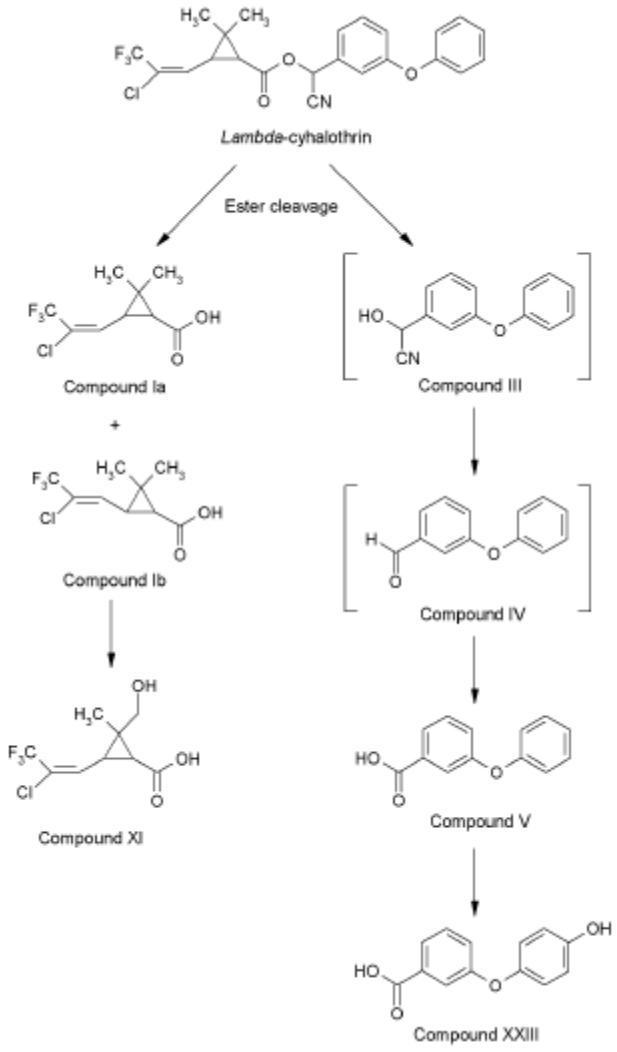


Figure 2 Metabolic pathway of lambda-cyhalothrin in livestock

Plant metabolism

The metabolism lambda-cyhalothrin was investigated for foliar treatment in five crops representing four crop groups: fruit (apple), leafy vegetable (cabbage), cereal (wheat) and oilseed (cotton and soya beans). The labelling position of [^{14}C]lambda-cyhalothrin used in the studies is summarised in Table 5.

The metabolism of cyhalothrin is limited to a small range of transformation steps. The cleavage of the ester bond is normally the first metabolism step followed by hydroxylation of the breakdown products. Translocation of the radioactivity with the plants investigated was not observed.

Wheat

In the two studies conducted by French for wheat grain and Leahey for wheat foliage (both 1990) lambda-cyhalothrin was formulated either as [cyclopropyl-^{14}C]- or [phenyl-^{14}C]lambda-cyhalothrin in an emulsifiable concentrate (GFU383C) and was applied two or three times at a rate of 220 g ai/ha to winter wheat.

Winter wheat (Parade) was sown in the field in a loam soil on October 4, 1988. Three plots were treated with [phenyl-^{14}C]lambda-cyhalothrin and three with [cyclopropyl-^{14}C]lambda-cyhalothrin.

Treatment A: Two applications were made at 0.22 kg ai/ha, the first treatment at crop emergence and the second just prior to ear emergence. The wheat was harvested 14 days after the second application.

Treatment B: Two applications were made at 0.22 kg ai/ha, the first treatment at crop emergence and the second just prior to ear emergence. The wheat was harvested, at maturity, 85 days after the second application.

Treatment C: Three applications were made at 0.22 kg ai/ha, the first treatment at crop emergence and the second just prior to ear emergence and the third 30 days before maturity. The wheat was harvested 30 days after the third application.

The radioactivity was extracted using acetonitrile/water followed by partitioning with dichloromethane. Metabolites in the extracts were identified and quantified with TLC.

For wheat grain treatment A resulted in very low total radioactive residues of 0.007 mg/kg for the [phenyl-^{14}C]-label and of 0.002 mg/kg for the [cyclopropyl-^{14}C]-label. Further identification or characterisation of the radioactivity was not achieved.

Treatment B (see Table 22) gave comparable results for [phenyl-^{14}C]-labelled lambda-cyhalothrin with 0.005 mg/kg. Slightly higher radioactivity was detected for the [cyclopropyl-^{14}C]-label with 0.018 mg/kg in the grain. Trace amounts of lambda-cyhalothrin and three metabolites (the cyclopropane acid isomers, compound Ia and compound Ib and the associated hydroxylated material, compound XI) were detected in the grain. Much of the remaining residue was characterised as water-soluble radioactivity remaining after hydrolysis with 6M hydrochloric acid.

Table 22 Radioactive residues of identified analytes in mature grain from wheat treated prior to and following ear emergence with two applications of [cyclopropyl-^{14}C]- and [phenyl-^{14}C]lambda-cyhalothrin (treatment B)

Position of ^{14}C-labelling	Analyte	Proportion of radioactivity in grain [%]	Residue [mg/kg]
[phenyl-^{14}C]-labelled	TRR	100 (no further characterisation)	0.005
[cyclopropyl-^{14}C]-labelled	TRR	100	0.018
	lambda-cyhalothrin isomers	0.2	< 0.001
	compound Ia	3.0	< 0.001
	compound Ib	1.5	< 0.001
	compound XI	2.5	< 0.001
	water-soluble[a]	56.6	0.01

[a] after hydrolysation with 6M hydrochloric acid

For treatment C, where the last application was after the formation of the ears, significant residues were detected in the mature grain (see Table 23). Most of the radioactivity was identified as unchanged parent lambda-cyhalothrin. The metabolites compound Ia and V could be found in traces < 0.001 mg/kg only.

Table 23 Radioactive residues of identified analytes in mature grain from wheat treated prior to and following ear emergence with three applications of [cyclopropyl-^{14}C]- and [phenyl-^{14}C]lambda-cyhalothrin (treatment C)

Position of ^{14}C-labelling	Analyte	Proportion of radioactivity in grain [%]	Residue [mg/kg]
[phenyl-^{14}C]-labelled	TRR	100	0.112
	lambda-cyhalothrin	83.4	0.093
	compound V	0.8	< 0.001
[cyclopropyl-^{14}C]-labelled	TRR	100	0.131
	lambda-cyhalothrin	76.4	0.100
	compound Ia	0.2	< 0.001

The remainder of the residue was fractionated into organo-soluble radioactivity (0.8–7.7%, < 0.001–0.012 mg/kg), water-soluble radioactivity after acid hydrolysis (4.6–8.1% TRR, 0.005–0.011 mg/kg) and unextractable radioactivity (2.2–2.6% TRR, 0.003 mg/kg). These individual fractions contained residues of 0.011 mg/kg or less each.

For wheat foliage only the plant from treatment plots A and C were investigated. The TRR in wheat foliage was relatively high compared to wheat grain accounting for 0.45 to 1.8 mg/kg for treatment A and 8–10 mg/kg for treatment C. In both cases most of the detected radioactivity was identified as unchanged lambda-cyhalothrin (> 75% TRR). Metabolites in the foliage were found at levels below 2% of the TRR, mostly compounds Ia and b, V, VI, XI and XIX. The results are presented in Tables 24 and 25.

Table 24 Radioactive residues of identified analytes in foliage from wheat plants treated with two applications of ^{14}C-cyclopropyl-labelled and ^{14}C-phenyl-labelled lambda-cyhalothrin (treatment A)

Position of ^{14}C-labelling	Analyte	Radioactivity [%]	Residue [mg/kg]
[phenyl-^{14}C]-labelled	TRR	100	1.81
	lambda-cyhalothrin	87.3	1.58
	compound V	0.1	0.002
	compound VI	0.1	0.002
[cyclopropyl-^{14}C]-labelled	TRR	100	0.451
	lambda-cyhalothrin	91	0.41

Table 25 Radioactive residues of identified analytes in straw from wheat plants treated prior to and following ear emergence with three applications of [cyclopropyl-^{14}C]- and [phenyl-^{14}C]lambda-cyhalothrin (treatment C)

Position of ^{14}C-labelling	Analyte	Proportion of radioactivity in straw [%]	Residue [mg/kg]
[phenyl-^{14}C]-labelled	TRR	100	7.95
	lambda-cyhalothrin	80.0	6.360
	compound V	1.2	0.095
	compound XIX	1.4	0.111
[cyclopropyl-^{14}C]-labelled	TRR	100	10.0
	lambda-cyhalothrin	83.8	8.38
	compound Ia	1.6	0.16
	compound Ib	0.1	0.01
	compound XI	0.2	0.02

The remainder of the residue was characterised as polar organo-soluble radioactivity (treatment A: 1.5–2.0% TRR, treatment C: 1.8–2.1% TRR), water soluble radioactivity after acid

hydrolysis (treatment A: 1.0–3.3% TRR, treatment C: 1.3–1.5% TRR) and unextracted radioactivity (treatment A: 1.9–7.3% TRR, treatment C: 4.2–8.3% TRR).

Soya beans

Radioactive residues in soya beans were investigated by French (1986 and 1986a). Lambda-cyhalothrin was used either as [cyclopropyl-^{14}C]- or [benzyl-^{14}C]lambda-cyhalothrin, formulated as an emulsifiable concentrate (JF9148). Soya bean seeds were planted in six pots and after germination the plants were kept in a greenhouse throughout the study. Two pots were treated with [cyclopropyl-^{14}C]lambda-cyhalothrin and two with [benzyl-^{14}C]lambda-cyhalothrin. The remaining two pots were maintained alongside the treated pots and acted as controls. Two applications were made. The first application was made when first pod set occurred and the second application was made 18 days later. The rate of application for each treatment was equivalent to 20 g/ha. Soya bean leaves were taken for analysis 39 days after the first application and soya beans were harvested 51 days after the first application.

The residues in the different samples were extracted with acetonitrile/water followed by partitioning with dichloromethane. Identification and quantification of the residues was achieved with TLC.

In soya beans only very low radioactive residues were found. For both labels the TRR ranged from 0.003–0.01 mg/kg which allowed no further characterisation by TLC.

For soya bean plants higher radioactive residues were found ranging from 1.2–1.87 mg/kg. For both labels, lambda-cyhalothrin contributed about half of the TRR (43–52%). Compound Ia was identified as the major metabolite for the [cyclopropyl-^{14}C]- label with 25% of the TRR. Further metabolites identified were compounds Ib, III, V, VI, XI and XIII in quantities below 10% of the TRR each. A summary of the results is presented in Table 26.

Table 7 Radioactive residues in foliage from soya bean plants treated with two applications of [cyclopropyl-^{14}C]- and [benzyl-^{14}C]lambda-cyhalothrin

Position of ^{14}C-labelling	Analyte	Radioactivity range [%]	Residue [mg/kg]
[benzyl-^{14}C]-labelled	TRR	100	1.2-1.45
	lambda-cyhalothrin	42.9-47.3	0.51-0.57
	compound III	2.2-3.4	0.03-0.04
	compound V	4.5-6.7	0.05-0.08
	compound VI	3.9-5.5	0.05-0.07
	compound XIII	4.6-7.0	0.06-0.08
	3 unidentified compounds	11.5-15.8 [a]	0.14-0.19
[cyclopropyl-^{14}C]-labelled	TRR	100	1.48-1.87
	lambda-cyhalothrin	51.7-52.0	0.77
	compound Ia	25.0-25.3	0.37
	compound Ib	1.4-2.0	0.02-0.03
	compound XI	2.0-2.4	0.03-0.04

[a] no individual compound > 5% TRR

The remainder of the residue consisted of polar radioactivity (2.3–5.7% TRR, 0.04–0.07 mg/kg), water soluble radioactivity remaining after acid hydrolysis (2.3–4.3% TRR, 0.03–0.05 mg/kg) and radioactivity not extracted by acetonitrile and acetonitrile/water, 1:1 (3.4–4.2% TRR, 0.05 mg/kg).

Cotton

The uptake and metabolism of lambda-cyhalothrin in cotton leaves was investigated in two studies by French (1986b and 1986c). [Benzyl-^{14}C]lambda-cyhalothrin and [cyclopropyl-^{14}C]lambda-cyhalothrin, both formulated as an emulsifiable concentrate (JF9148) were used in these studies. Cotton plants were grown in three 30 cm diameter pots. Two pots were treated with ^{14}C-lambda-cyhalothrin and the third pot was maintained alongside the treated pots and acted as a control. The

plants were treated three times. The first application was made when the plants started to flower. The second treatment was made three weeks later and the final treatment was made after a further four weeks. The rate of application for each treatment was equivalent to 66 g ai/ha. The plants were grown to maturity and leaves were harvested from the plants 80 days after the first application.

The samples were extracted with acetonitrile/water and subsequently partitioned with hexane or hydrolysed with hypochloric acid. Identification and quantification was achieved via TLC and HPLC in combination with radio detection.

The TRR in the foliage from the [benzyl-^{14}C]-labelled study was 2.93–3.22 mg/kg (average = 3.08 mg/kg). Most of the residues consisted of unchanged lambda-cyhalothrin in levels of 52% of the TRR. Additional metabolites (compound III, IV, V, VI, IX and XIII) were also identified, but the individual levels were all below 10% of the TRR (see Table 27). The remainder of the residue consisted of organo-soluble radioactivity (0.6% TRR, 0.02 mg/kg), water soluble radioactivity after acid hydrolysis (8.4% TRR, 0.27 mg/kg) and unextracted radioactivity (3.7% TRR, 0.12 mg/kg).

The total radioactive residues in the foliage from the [cyclopropyl-^{14}C]-labelled study were 3.73–4.06 mg/kg (average = 3.90 mg/kg). Again the main part of the TRR was lambda-cyhalothrin (37%). Compound Ia was also detected (18%), followed by compound Ib and XI (7.1% and 3.6% respectively) (see Table 28). The remainder of the residue consisted of polar organosoluble compounds (4.4% TRR, 0.18 mg/kg), uncharacterised organosoluble radioactivity (2.7% TRR, 0.11 mg/kg), water soluble radioactivity after acid hydrolysis (9.9% TRR, 0.40 mg/kg) and unextracted radioactivity (7.5% TRR, 0.30 mg/kg).

Table 27 Radioactive residues in leaves from cotton plants treated with three applications of [benzyl-^{14}C]lambda-cyhalothrin

Analyte	Radioactivity range [%]	Residue [mg/kg]
TRR	100	2.93-3.22
lambda-cyhalothrin	52.3-52.4	1.68-1.69
compound III	4.2-6.0	0.14-0.19
compound IV	0.4-0.5	0.01-0.02
compound V	6.5-8.4	0.21-0.28
compound VI	6.7-8.7	0.22-0.28
compound IX	0.9	0.03
compound XIII	4.0-7.1	0.13-0.23
3 unidentified compounds	2.0-3.0	0.06-0.07

Table 8 Radioactive residues in leaves from cotton plants treated with three applications of [cyclopropyl-^{14}C]lambda-cyhalothrin

Analyte	Radioactivity [%]	Residue [mg/kg]
TRR	100	3.73-4-06
lambda-cyhalothrin	36.8	1.49
compound Ia	17.6	0.71
compound Ib	7.1	0.29
compound XI	3.6	0.15
7 unidentified compounds	5.3	0.22

A study was performed by French (1985) to measure the transfer of residues into cotton seed after foliar application and to determine the metabolism of lambda-cyhalothrin when applied directly to cotton seed. Lambda-cyhalothrin was used as [cyclopropyl-^{14}C]- or [benzyl-^{14}C]lambda-cyhalothrin, formulated as an emulsifiable concentrate (JF9148). Cotton plants were grown in six 30 cm diameter pots. Two pots were treated with [benzyl-^{14}C]lambda-cyhalothrin and two with

[cyclopropyl-^{14}C]lambda-cyhalothrin. The remaining two pots were maintained alongside the treated pots and acted as controls. The plants were treated three times. The first application was made when the plants started to flower, the second treatment was made three weeks later and the final treatment was made after a further four weeks. The rate of application for each treatment was equivalent to 66 g/ha. The plants were grown until the cotton bolls were ripe and then seven bolls were harvested from each plant 101 days after the first application.

In addition, two ripe bolls were selected on the plants treated with [benzyl-^{14}C]lambda-cyhalothrin. Three seeds in each selected boll were directly spotted with [benzyl-^{14}C]lambda-cyhalothrin (1 µg per seed) using a micro-litre syringe. Similar treatments were made on seeds on the plants treated with [cyclopropane-^{14}C]lambda-cyhalothrin. These seeds were then harvested after 14 days.

The samples were extracted with hexane and subsequently partitioned with acetonitrile/water and/or dichloromethane or hydrolysed with hydrochloric acid. Identification and quantification was achieved with HPLC in combination with radio-detection.

The seeds directly spotted with [cyclopropyl-^{14}C]lambda-cyhalothrin were analysed and it was shown that virtually all radioactivity on the seed was due to unchanged lambda-cyhalothrin. Since degradation did not occur, the seeds spotted with [benzyl-14C]lambda-cyhalothrin were not analysed.

The total radioactive residues in the seeds which were not directly spotted had very low levels from 0.01 for the [benzyl-^{14}C]-label to 0.02–0.027 mg/kg for the [cyclopropyl-^{14}C]-label. Identification of the residues was not achieved. Characterisation was only performed for the [cyclopropyl-^{14}C]-label and indicated a hexane-soluble fraction of about 32% of the TRR. Aqueous acid soluble radioactivity and unextractable radioactivity accounted about 27% of the TRR each (see Table 29).

Table 29 Characterisation of radioactivity in cotton seeds from plants treated with three applications of [cyclopropyl-^{14}C]lambda-cyhalothrin

Extraction	Radioactivity [%]	Residue [mg/kg]
Hexane soluble radioactivity	31.5	0.007
Acetonitrile soluble radioactivity	14.4	0.003
Aqueous acid soluble radioactivity	26.8	0.006
Unextractable radioactivity	29.8	0.007

Cabbage

Cyhalothrin radiolabelled in the cyclopropane ring and formulated as an emulsifiable concentrate (JF8667) was used by Curl (1983) to study the metabolism in cabbage. Sixteen cabbage plants were grown in individual pots. Fourteen of these pots were kept outside in a polythene shelter. Individual leaves on these fourteen plants were spotted with 1 µL drops of [^{14}C]-cyhalothrin (approximately 26 µg per leaf) using a micro-litre syringe. These plants were exposed to direct sunlight by removing the lid of the shelter in fine weather, but in poor weather and overnight the plants were covered to ensure that residues were not washed off by rain. Treated leaves were removed from these plants at intervals of 2, 4, 5, 6 and 7 weeks.

The remaining two plants were sprayed with [^{14}C]cyhalothrin at weekly intervals. One plant was sprayed four times and the second plant was sprayed eight times. The spray rate used was equivalent to 55 g ai/ha. Each plant was harvested one week after the final treatment.

The samples were extracted with acetonitrile and cleaned up by solid-phase extraction and RP-HPLC. Identification was achieved by TLC and quantification by HPLC.

Leaves which had been spotted with [^{14}C]cyhalothrin and harvested after 2, 4, 5 and 6 weeks were analysed. Recoveries of 100–106% of the applied radioactivity were obtained with all of these leaves. The percentage of the applied radioactivity identified as cyhalothrin is shown in Table 30.

Table 30 Radioactivity identified as [^{14}C]cyhalothrin in leaves from cabbage plants treated with one application of [cyclopropyl-^{14}C]cyhalothrin

Point of Sampling Time	Radioactivity of [^{14}C]cyhalothrin [%]
After 2 weeks	83.6
After 4 weeks	76.7
After 5 weeks	53.5
After 6 weeks	54.0

Leaves harvested after 6 weeks were analysed in detail to identify further metabolites in the sample. Compound Ia and Ib were the only structures found in levels of 4.0 and 3.6% of the TRR respectively (see Table 31). The remainder of the residue was characterised as water soluble radioactivity after acid hydrolysis (3.1%), unextracted radioactivity (11.0%) and losses during preparation of samples for analysis (14.8%).

Table 31 Identified analytes in leaves from cabbage plants sampled six weeks after last application with [cyclopropyl-^{14}C]cyhalothrin

Analyte	Radioactivity [%]
cyhalothrin	54.0
compound Ia	4.0
compound Ib	3.6
7 characterised compounds	9.5

Analysis of the plant given eight spray applications showed that the residue in the whole plant was 0.44 mg/kg. Most of this residue was concentrated on the exposed outer leaves (1.13 mg/kg) with negligible residues (0.003 mg/kg) detected in the inner leaves. The radioactivity of identified analytes in outer leaves are summarised in Table 32. Hearts of the cabbage were not further investigated. The remainder of the residue was characterised as water-soluble radioactivity after acid hydrolysis (0.6% TRR, 0.007 mg/kg), unextracted radioactivity (4.6% TRR, 0.05 mg/kg) and losses during preparation of samples for analysis (7.1% TRR, 0.08 mg/kg).

Table 32 Identified analytes in outer leaves from cabbage plants sampled six weeks after last application with ^{14}C-cyclopropyl-labelled cyhalothrin

Analyte	Radioactivity [%]	Residue [mg/kg]
TRR	100	1.13
Cyhalothrin	80.1	0.91
Compound Ia	3.0	0.03
Compound Ib	0.8	0.009
5 characterised compounds	3.8	0.04

Apple

The metabolism of [cyclopropyl-^{14}C]-cyhalothrin in apple was investigated by Hall (1979). Radiolabelled cyhalothrin was formulated as an emulsifiable concentrate (JF6425) and was applied directly to apples growing on a tree. A polythene shelter with open sides was erected over a small apple tree. This protected the apples on the tree from rainfall and hence the possibility that any residues would be washed off. Ten apples on the tree were selected for treatment. Approximately one third of the surface area of the selected apples was marked out with a felt tipped pen and these areas were chosen so as to face the predominant direction of incident sunlight. The apples were treated by spotting the [^{14}C]cyhalothrin over these marked areas (approximately 33 µg per apple). Two treated apples were harvested at intervals of 0, 7, 14, 28, and 56 days after treatment.

The samples were extracted with acetone/water. The solid residues were additionally extracted using hexane. The acetone/water extracts were partitions between hydrochloric acid and dichloromethane. Identification and quantification was achieved via TLC. Recoveries of the samples were all between 99–100%.

Analysis of the apples showed that very little degradation occurred during 0 to 28 days. More than 97% of the recovered radioactivity co-eluted with cyhalothrin.

After 56 days a small amount of degradation had occurred. Still most of the TRR (89.5%) consisted of unchanged cyhalothrin. In addition, compounds Ia and Ib were detected in minor amounts (2.7% and 0.4% of the TRR respectively) (see Table 33). The remainder of the residue was characterised as water-soluble after acid hydrolysis (0.6% TRR) and unextracted radioactivity (2.9% TRR).

The flesh directly below the treated area of skin was analysed separately for the apples harvested after 28 and 56 days. This showed that only a very small part of the radioactivity on the apple had translocated from the skin into the flesh (0.2% after 28 days, 0.4% after 56 days).

Table 33 Identified analytes in apples growing on a tree and directly treated with one application of [cyclopropyl-^{14}C]cyhalothrin

Analyte	Radioactivity [%]
lambda-cyhalothrin	89.5
compound Ia	2.7
compound Ib	0.4

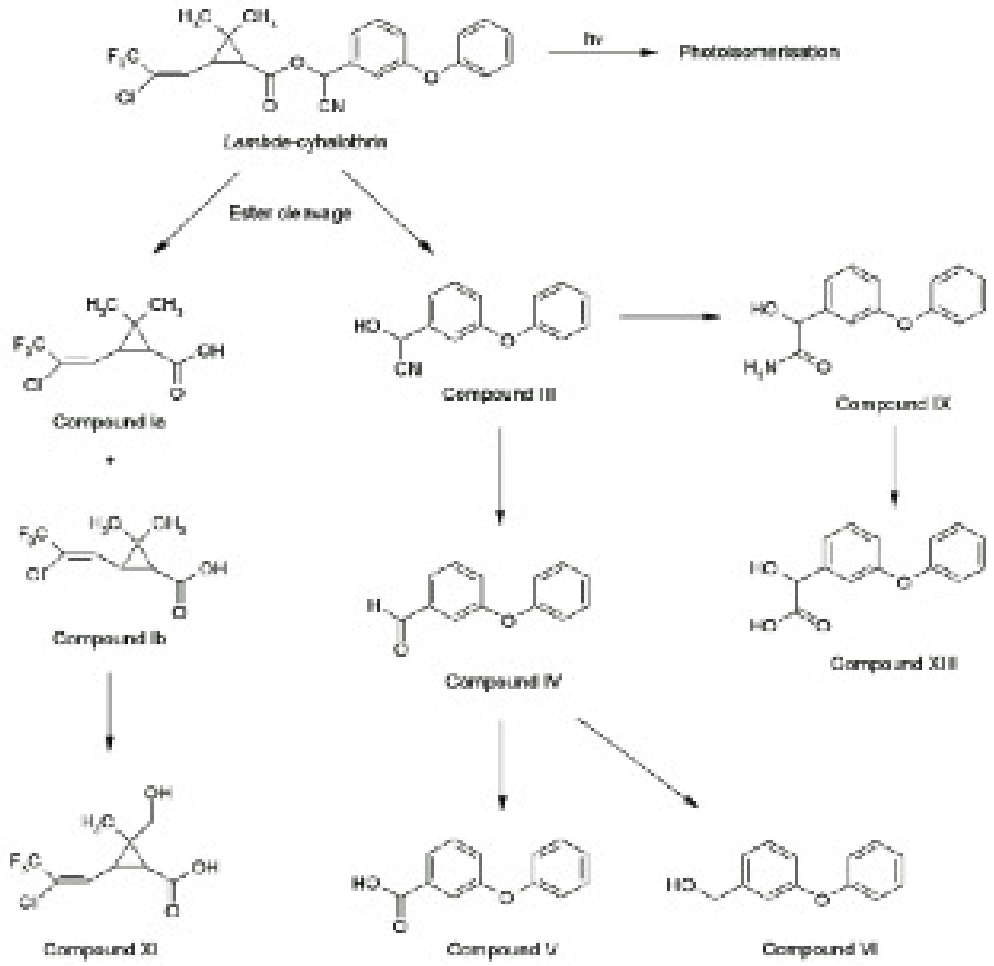


Figure 3 Metabolic pathways of lambda-cyhalothrin in plants

Environmental fate in soil

The 2003 JMPR (JMPR, 2003) identifies the data requirements for studies of environmental fate. The focus should be in those aspects that are most relevant to MRL setting. For lambda-cyhalothrin, supervised residue trials data are available for root and tuber vegetables, which indicate that aerobic degradation in soil is relevant, as well as the normal requirements for hydrolysis and rotational crop studies. The 2003 report does not mention soil photolysis studies; however, such studies should be relevant for the same reasons as for aerobic soil degradation – nature and magnitude of residues in soil.

The Meeting received information on soil aerobic metabolism and soil photolysis properties of lambda-cyhalothrin (or cyhalothrin) as well as studies on the behaviour in crop rotations.

Photolysis on soil

In a study by Parker (1986) [cyclopropyl-^{14}C]- and [phenyl-^{14}C]lambda-cyhalothrin was applied to the surface of a thin layer of soil spread over small stainless steel plates at a rate equivalent to 40 g ai/ha. The irradiation source was a xenon arc light, filtered to represent the spectral distribution of sunlight. The intensity of the radiation incident on the soil plates was comparable to that of natural sunlight at latitude 30ºN in summer. The irradiated plates were taken for analysis at intervals equivalent to 6, 14, 26 and 34 days of sunlight for the [cyclopropyl-^{14}C]-labelled treatment, and at intervals equivalent to 7, 16, 24 and 35 days for the [phenyl-^{14}C]-labelled treatment at a temperature of approximately 25 °C. The plates were irradiated in a sealed system so that any volatile products formed could be trapped. The nature of the extractable degradation products was characterised at each sampling interval. The nature of the degradation products at the final sampling date is summarised in Tables 34 and 35.

The results indicate a slow degradation of the parent compound. The metabolites, compounds II, IV and V, were identified, but none of them were found in levels above 5.5% of the radioactivity. The difference between radiated and dark control samples is based on the higher water content in the dark samples.

Table 34 Distribution of radioactivity extracted from soil treated with [cyclopropyl-^{14}C]lambda-cyhalothrin

Residue	34 Days Irradiation (% AR)	30 Days Dark Control (%AR)
lambda-cyhalothrin	83.5	74.1
compound II	5.5	17.1
unidentified Compounds	4.2	3.4
unidentified Polar Compounds	2.5	0.6

Table 35 Distribution of radioactivity extracted from soil treated with [phenyl-^{14}C] lambda-cyhalothrin

Residue	35 Days Irradiation (% AR)	30 Days Dark Control (%AR)
lambda-cyhalothrin	86.7	73.6
compound II	5.1	17.8
compound IV	1.0	Not Detected
compound V	2.6	Not Detected
unidentified Compounds	Not Detected	1.8
unidentified Polar Compounds	1.5	Not Detected

Soil metabolism

Cyhalothrin and lambda-cyhalothrin, ^{14}C-radiolabelled in the cyclopropane ring, were separately applied at the nominal rate of 100 g ai/ha to a sandy loam soil and incubated in dark enclosed systems, at 20 °C, in a stream of moist air (Bharti, 1985). Additional incubations were carried out which monitored the fate of cyhalothrin at a reduced temperature (10 °C), higher rates of application

(500 g ai/ha) and in a loamy sand soil. Soil was incubated with the moisture content adjusted to 40% of maximum water holding capacity.

During the study significant mineralisation was observed (up to 70% evolved $^{14}CO_2$ after 26 weeks). The separate monitoring of the fate of lambda-cyhalothrin showed that racemisation of the enantiomers at the α-carbon was not a relevant pathway in soil.

The major extractable degradation products were the hydroxylated parent material (compound XV) and the ester hydrolysis product (compound Ia) which represented up to 12% and 8% of the applied material, respectively, between 14 and 63 days after application, and declined thereafter. Modification of the aerobic incubation conditions affected the rate of degradation of the test material, but not the route of metabolism.

Unextracted material was seen to increase during the early stages of aerobic incubation, but reached a plateau at approximately 20% of the applied material at about 60 days after application.

Aerobic soil metabolism studies are summarised below, showing the test conditions, the nature of the soils, estimated half-lives and the nature of identified soil metabolites.

Aerobic soil metabolism

Ref: Bharti, 1985
Test material: cyclopropyl-^{14}C-cyhalothrin — Dose rate: 100 g ai/ha
Duration: 181 days — Temp: 20 °C
Moisture: 40% maximum holding capacity — Soil: 18 Acres, sandy loam
pH: 6.7–6.8 — Organic carbon: 4.0–4.6%
Half-life (parent): 25.7 days — ^{14}C accountability: 95–101%
% cyhalothrin remaining: 5.7% after 181 days — % mineralisation: 70.4% after 181 days
% unextractable: 18.7% after 181 days

Metabolites	Max (% of dose)	Day
compound Ia	7.6%	14
compound XV	11.1%	30

Aerobic soil metabolism

Ref: Bharti, 1985
Test material: cyclopropyl-^{14}C-cyhalothrin — Dose rate: 100 g ai/ha
Duration: 90 days — Temp: 10 °C
Moisture: 40% maximum holding capacity — Soil: 18 Acres, sandy loam
pH: 6.7–6.8 — Organic carbon: 4.0–4.6%
Half-life (parent): 50 days — ^{14}C accountability: 85–106%
% cyhalothrin remaining: 28.8% after 90 days — % mineralisation: 31.2% after 90 days
% unextractable: 14.2% after 90 days

Metabolites	Max (% of dose)	Day
compound Ia	5.5%	90
compound XV	6.9%	90

Aerobic soil metabolism

Ref: Bharti, 1985
Test material: cyclopropyl-^{14}C-cyhalothrin — Dose rate: 500 g ai/ha
Duration: 90 days — Temp: 20 °C
Moisture: 40% maximum holding capacity — Soil: 18 Acres, sandy loam
pH: 6.7–6.8 — Organic carbon: 4.0–4.6%
Half-life (parent): 48.1 days — ^{14}C accountability: 98–103%
% cyhalothrin remaining: 26.4% after 90 days — % mineralisation: 37% after 90 days

% unextractable: 14.3% after 90 days

Metabolites	Max (% of dose)	Day
compound Ia	7.3%	90
compound XV	4.5%	90

Aerobic soil metabolism

Ref: Bharti, 1985
Test material: cyclopropyl-^{14}C-cyhalothrin — Dose rate: 100 g ai/ha
Duration: 181 days — Temp: 20 °C
Moisture: 40% maximum holding capacity — Soil: Frensham, loamy sand
pH: 5.3 — Organic carbon: 2.0%
Half-life (parent): 82.9 days — ^{14}C accountability: 92–103%
% cyhalothrin remaining: 21.4% after 181 days — % mineralisation: 37.6% after 181 days
% unextractable: 14.7% after 181 days

Metabolites	Max (% of dose)	Day
compound Ia	4.0%	30
compound XV	4.1%	181

Aerobic soil metabolism

Ref: Bharti, 1985
Test material: cyclopropyl-^{14}C-lambda-cyhalothrin — Dose rate: 100 g ai/ha
Duration: 92 days — Temp: 20 °C
Moisture: 40% maximum holding capacity — Soil: 18 Acres, sandy loam
pH: 6.7–6.8 — Organic carbon: 4.0–4.6%
Half-life (parent): 21.4 days — ^{14}C accountability: 86–93%
% cyhalothrin remaining: 24.4% after 92 days — % mineralisation: 35.6% after 92 days
% unextractable: 16.8% after 92 days

Metabolites	Max (% of dose)	Day
compound Ia	6.2%	30
compound XV	12.1%	63

Since these studies involved labelling of the acid-moiety only, supplementary studies using cypermethrin were submitted. The alcohol-moiety of cypermethrin is comparable to lambda-cyhalothrin. Corresponding to lambda-cyhalothrin the cleavage of the ester bond is the first metabolic step resulting in the comparable alcohol-moiety metabolite compound III, which then proceeds through similar degradation steps.

In a study by Harvey (1981) [benzyl-^{14}C]cypermethrin was applied to three soils at a nominal rate of 200 g ai/ha. The soils, a clay loam, a loamy sand and a peat, were incubated in dark enclosed systems, at 25 °C, in a stream of moist air. Additional incubations were carried out which monitored the fate of cypermethrin at reduced and increased temperatures (15 °C and 35 °C), higher rates of application (2 kg ai/ha), and sterile conditions. The soils were maintained throughout the study at approximately 40% moisture holding capacity by the regular addition of the required amount of distilled water.

During the study significant mineralisation was observed (up to 70% evolved $^{14}CO_2$ after 25 weeks). The major extractable degradation products were derived from hydrolysis of the central ester linkage to give 3-phenoxybenzaldehyde (compound IV) and hydroxylation of the parent material to give compound XV. Following the hydrolysis route, compound IV represented up to 6.4% of the applied radioactivity in the first few hours following application, while 3-phenoxybenzoic acid (compound V) represented up to 15.2% of the applied material after 3 weeks. Hydroxylation of the parent pyrethroid is a minor route of degradation. The level of hydroxy-cypermethrin reached a maximum level of approximately 5% applied radioactivity after 21 days incubation and declined thereafter.

Unextracted material was seen to increase during the early stages of aerobic incubation, but reached a plateau of between 20% and 40% of the applied material at around 10 weeks after application.

Aerobic soil metabolism

Ref: Harvey, 1981
Test material: benzyl-^{14}C-cypermethrin — Dose rate: 200 g ai/ha
Duration: 175 days — Temp: 25 °C
Moisture: 40% maximum holding capacity — Soil: Gore, clay loam
pH: 7.5 — Organic carbon: 12.2%
Half-life (parent): 7 days — ^{14}C accountability: 92–112%
% cypermethrin remaining: 3.9% after 70 days — % mineralisation: 69.3% after 175 days
% unextractable: 22% after 175 days

Metabolites	Max (% of dose)	Day
compound III	2.9%	7
compound IV	9%	7
compound IX	1.6%	21

Aerobic soil metabolism

Ref: Harvey, 1981
Test material: benzyl-^{14}C-cypermethrin — Dose rate: 2000 g ai/ha
Duration: 175 days — Temp: 25 °C
Moisture: 40% maximum holding capacity — Soil: Gore, clay loam
pH: 7.5 — Organic carbon: 12.2%
Half-life (parent): 21 days — ^{14}C accountability: 84-110%
% cypermethrin remaining: 3.6% after 175 days — % mineralisation: 65.0% after 175 days
% unextractable: 23% after 175 days

Metabolites	Max (% of dose)	Day
compound III	2.9%	2h
compound IV	9.4%	7
compound IX	4.9%	7

Aerobic soil metabolism

Ref: Harvey, 1981
Test material: benzyl-^{14}C-cypermethrin — Dose rate: 200 g ai/ha
Duration: 175 days — Temp: 15 °C
Moisture: 40% maximum holding capacity — Soil: Gore, clay loam
pH: 7.5 — Organic carbon: 12.2%
Half-life (parent): 14 days — ^{14}C accountability: 70–111%
% cypermethrin remaining: 5.2% after 175 days — % mineralisation: 51.5% after 175 days
% unextractable: 32% after 175 days

Metabolites	Max (% of dose)	Day
compound III	2.5%	2h
compound IV	9.8%	7
compound IX	4.2%	7

Aerobic soil metabolism

Ref: Harvey, 1981
Test material: benzyl-^{14}C-cypermethrin — Dose rate: 200 g ai/ha
Duration: 175 days — Temp: 35 °C
Moisture: 40% maximum holding capacity — Soil: Gore, clay loam
pH: 7.5 — Organic carbon: 12.2%
Half-life (parent): 7 days — ^{14}C accountability: 79–110%
% cypermethrin remaining: 5.9% after 70 days — % mineralisation: 64.9% after 175 days

% unextractable: 27% after 175 days

Metabolites	Max (% of dose)	Day
compound III	2.3%	7
compound IV	15.2%	7
compound IX	1.0%	7

Aerobic soil metabolism

Ref: Harvey, 1981
Test material: benzyl-^{14}C-cypermethrin — Dose rate: 200 g ai/ha
Duration: 175 days — Temp: 25 °C
Moisture: 40% maximum holding capacity — Soil: Frensham, loamy coarse sand
pH: 6.1 — Organic carbon: 1.8%
Half-life (parent): 14 days — ^{14}C accountability: 95–105%
% cypermethrin remaining: 6.9% after 175 days — % mineralisation: 60.3% after 175 days
% unextractable: 21% after 175 days

Metabolites	Max (% of dose)	Day
compound III	6.4%	2h
compound IV	4.6%	7
compound IX	3.2%	21

Aerobic soil metabolism

Ref: Harvey, 1981
Test material: benzyl-^{14}C-cypermethrin — Dose rate: 200 g ai/ha
Duration: 175 days — Temp: 25 °C
Moisture: 40% maximum holding capacity — Soil: Rosedean, Fen peat
pH: 7.4 — Organic carbon: 72.7%
Half-life (parent): 21 days — ^{14}C accountability: 93–108%
% cypermethrin remaining: 6.6% after 175 days — % mineralisation: 62.1% after 175 days
% unextractable: 23% after 175 days

Metabolites	Max (% of dose)	Day
compound III	< 0.1%	175
compound IV	12.3	7
compound IX	4.5%	7

Further investigations of unextractable residues were performed by Roberts (1981). Cypermethrin, radiolabelled separately in the cyclopropane- and benzyl-ring, was applied to a sandy loam and sandy clay loam soil and incubated in dark enclosed systems, at 25 °C, for 16 weeks. At the end of this period the soils were extracted with acetonitrile:water so that only the 'bound' residues remained. The 'bound' residues were then quantified before being mixed with fresh untreated soil and incubated further.

Significant quantities were further metabolised to $^{14}CO_2$ during this time. Up to 37% of the applied cyclopropane 'bound' residues were liberated as $^{14}CO_2$ after 18 weeks, with the corresponding levels for benzyl 'bound' residues being around 25%; this indicates that 'bound' pyrethroid residues arising from either the 'acid' or 'alcohol' moieties can be mineralised by soil organisms.

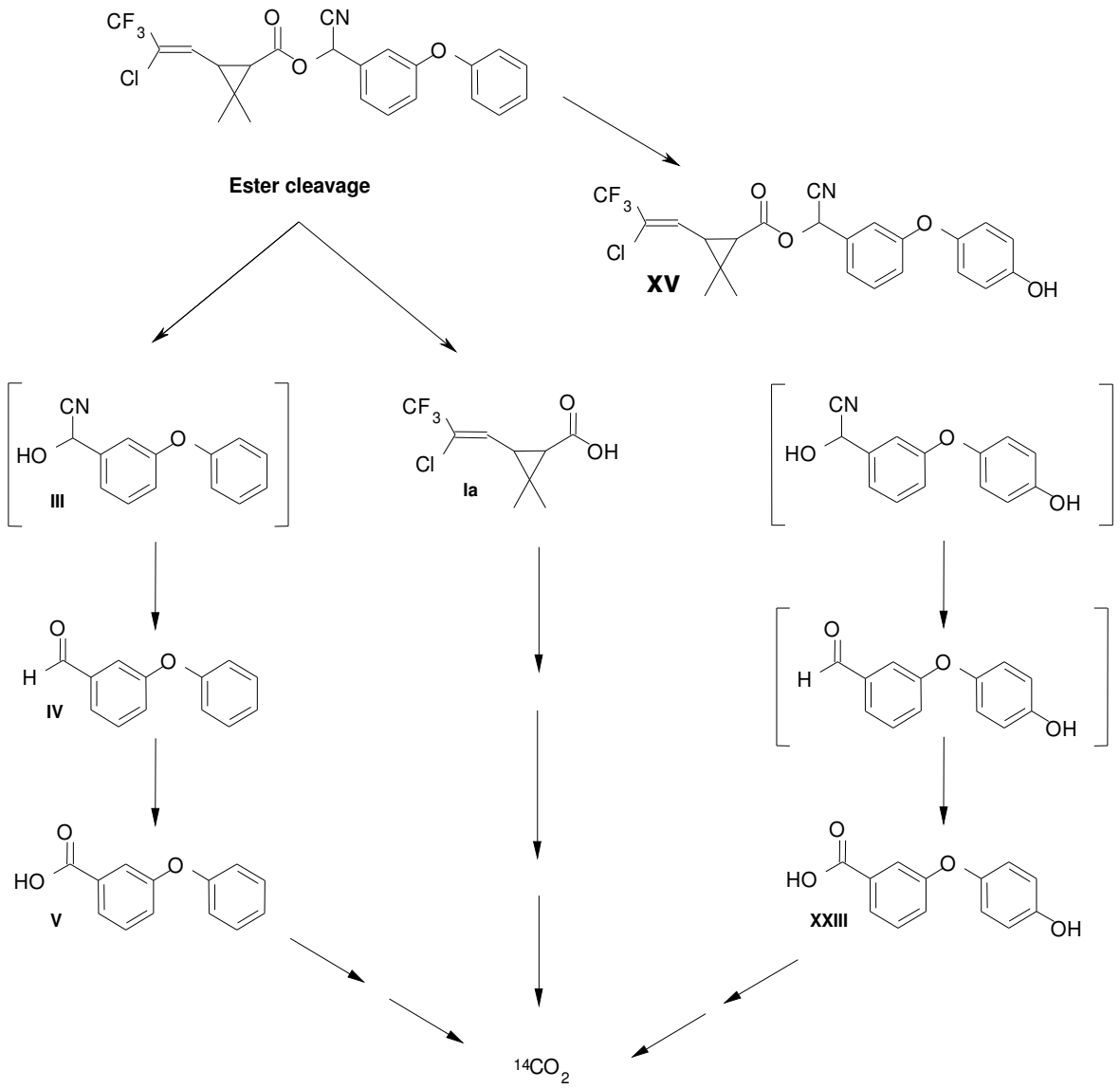


Figure 4 Proposed pathways for the aerobic metabolism of lambda-cyhalothrin in soil

Rotational crops

An experiment to investigate the behaviour of lambda-cyhalothrin in rotational crops was carried out by (Leahey, 1987a). In a greenhouse crops were planted in pots filled with a sandy loam soil which had been treated with radiolabelled lambda-cyhalothrin, formulated as an emulsifiable concentrate (JF9148). Eleven pots were treated with [phenyl-^{14}C]lambda-cyhalothrin and eleven with [cyclopropyl-^{14}C]lambda-cyhalothrin, each being treated at a rate approximately equivalent to 470 g/ha. For each radiolabel nine pots were used to grow crops and two were used to provide soil samples throughout the study.

Thirty days after soil treatment, wheat, lettuce and carrot seeds were planted separately in three pots treated with [phenyl-^{14}C]lambda-cyhalothrin and in three pots treated with [cyclopropyl-^{14}C]lambda-cyhalothrin. Similar plantings were made 60 and 120 days after soil treatment. Control crops were planted at the same times in untreated pots and these control crops were maintained alongside the treated pots. All crops were grown to maturity and were then harvested for analysis; samples of immature wheat forage were also taken. At each planting and each harvest interval, soil samples were taken for analysis.

For [phenyl-^{14}C]lambda-cyhalothrin total radioactive residues in the succeeding crops ranged from 0.002 mg/kg for carrot roots after 120 days up to 0.035 mg/kg for wheat straw after 30 days (see

Table 36). Due to the relatively low levels, further characterisation or identification of the residues was not achieved.

Table 36 Radioactive residues in different matrices of succeeding crops grown in soil treated with [phenyl-^{14}C]lambda-cyhalothrin

Sample Matrix	Residue after 30 days [mg/kg]	Residue after 60 days [mg/kg]	Residue after 120 days [mg/kg]
Immature wheat	0.008	0.005	0.004
Wheat straw	0.035	0.025	0.009
Wheat grain	0.005	0.009	0.003
Lettuce	0.007	0.009	0.004
Carrot leaves	0.005	0.004	0.004
Carrot root	0.003	0.004	0.002

The radioactive residues from the [cyclopropyl-^{14}C]lambda-cyhalothrin treatment were higher than from the [phenyl-^{14}C]lambda-cyhalothrin labelled treatment (see Table 37). Samples from carrot leaves and roots, lettuce and wheat were selected for further characterisation of the radioactivity found. In the plants, lambda-cyhalothrin was found in wheat only at levels of 0.5% of the TRR. Most of the residues were identified as compound Ia in amounts of 34–61% of the TRR. Further unidentified compounds were detected in levels up to 16% of the TRR. The results are presented in Table 38.

Table 37 Radioactive residues in different matrices of succeeding crops grown in soil treated with [cyclopropyl-^{14}C]lambda-cyhalothrin

Sample Matrix	Residue after 30 days [mg/kg]	Residue after 60 days [mg/kg]	Residue after 120 days [mg/kg]
Immature wheat	0.035	0.082	0.050
Wheat straw	0.850	0.082	0.240
Wheat grain	0.100	0.016	0.009
Lettuce	0.052	0.024	0.004
Carrot leaves	0.046	0.065	0.011
Carrot root	0.038	0.043	0.003

Table 38 Characterisation of radioactivity different matrices of succeeding crops grown in soil treated with [cyclopropyl-^{14}C]lambda-cyhalothrin

Analyte	Radioactivity [% TRR]			
	Carrot leaves, 60 day planting interval	Carrot root, 60 day planting interval	Lettuce, 30 day planting interval	Wheat, 30 day planting interval
Lambda-cyhalothrin	0.0	0.0	0.0	0.5
Compound Ia	40.7	51.6	61.1	34.0
Compound A (unidentified	16.2	7.7	3.3	15.8
Compounds B + C [a] (unidentified)	7.1	3.0	3.9	20.2
Polar compounds	2.1	1.0	2.9	9.0
Water soluble radioactivity remaining after acid hydrolysis	11.2	27.5	17.1	9.3
Fractions not analysed	9.6	7.2	8.5	0.0

Analyte	Radioactivity [% TRR]			
	Carrot leaves, 60 day planting interval	Carrot root, 60 day planting interval	Lettuce, 30 day planting interval	Wheat, 30 day planting interval
Unextracted	3.7	3.2	1.3	1.1

a B and C are not sufficiently resolved for separate quantification, but autoradiography indicates that they are present at approximately equal levels.

An additional experiment was carried out by Lloyd, Curl & Leahey (1984) in a greenhouse, in which crops were planted in pots filled with a sandy loam soil treated with [cyclopropyl-^{14}C]lambda-cyhalothrin formulated as an emulsifiable concentrate (JF9148). Nine pots were treated with [^{14}C]lambda-cyhalothrin, each being treated at a rate approximately equivalent to 110 g/ha. Thirty days after soil treatment wheat, lettuce and carrot seeds were planted separately in three pots. Similar plantings were made 120 days after soil treatment. Control crops were planted at the same times in untreated pots and these control crops were maintained alongside the treated pots. All crops were grown to maturity and were then harvested for analysis. Samples of immature wheat forage were also taken.

The total radioactive residues in the crops grown in the treated soil are shown in Table 39. These residues are corrected for residues detected in the control crops grown alongside the treated crops. This compensates for residues resulting from incorporation of [^{14}C]-CO_2, which evolved from soil treated with [^{14}C]lambda-cyhalothrin. Due to the low levels of radioactivity in the target crops, no further characterisation or identification of the residues was performed.

Table 39 Characterisation of radioactivity different matrices of succeeding crops grown in soil treated with [cyclopropyl-^{14}C]lambda-cyhalothrin

Sample Matrix	Radioactivity [mg/kg]	
	Planting Interval 30 days	Planting Interval 120 days
Immature wheat	0.008	0.001
Wheat straw	0.000	0.001
Wheat grain	0.000	0.000
Lettuce	0.002	0.001
Carrot leaves	0.002	0.000
Carrot root	0.000	0.000

METHODS OF RESIDUE ANALYSIS

Analytical methods

The Meeting received information on analytical methods or the determination of residues of the active substance cyhalothrin, lambda-cyhalothrin (enantiomeric pair B, cis 1RαS and cis 1SαR enantiomers of cyhalothrin), R157836 (enantiomeric pair A, cis 1RαR and cis 1SαS enantiomers of cyhalothrin) and/or some metabolites in target crops and animal products (milk, meat, kidney, liver, fat and eggs).

Samples of plant origin

The analytical methods for samples of plant origin are summarised below, including the commodities, for which the methods were validated, analytes and their limit of quantitation (LOQ), determination technique and a brief description of the method. Recoveries are shown in Table 40.

Reference: **Sapiets, 1985**

(Method)	**(RAM 070)**
Commodities:	**Apples, cabbage, grape, maize, peach, pear and sorghum**
Analytes:	**cyhalothrin, sum of isomers**
LOQ:	**0.01 mg/kg**
Determination:	**GC-ECD**
Description:	**Samples which had been accurately fortified with the internal standard (R116866 Cis B) are extracted by maceration in the presence of 50% acetone:hexane. The organic extracts were washed with water to remove acetone. Co-extracted lipids are removed by liquid partition chromatography where necessary, whilst all samples are subjected to adsorption chromatography to remove interfering endogenous material. Final quantitative determination of cyhalothrin is by gas-liquid chromatograph y using electron capture detection (GC-ECD) and internal standardisation.**
Reference:	**Swaine, 1984**
(Method)	**(RAM 081 & RAM 081/01)**
Commodities:	**Root vegetables, Leafy vegetables, Legume vegetables, Fruiting vegetables, Pome fruit, Stone fruit, Small fruits and berries, Cereal grains, Fodder and straw, Oilseed and Tropical seed**
Analytes:	**lambda-cyhalothrin**
LOQ:	**0.01 mg/kg**
Determination:	**GC-ECD (GC-MS in SIM-mode for confirmation)**
Description:	**Samples which have been accurately fortified with an internal standard (R177554) are extracted by homogenisation with 50% acetone:hexane. The organic extracts are washed with water to remove acetone. For some crops (e.g., hops and oilseed rape), a liquid-liquid partition chromatography step is included on a Florisil support between the hexane and acetonitrile extraction steps. All samples are cleaned-up by adsorption chromatography on silica or Florisil and final determination is by GC-ECD.**
Reference:	**Sapiets, 1994**
(Method)	**(RAM 081/02)**
Additional studies:	**Jones, 1995 (cauliflower validation)**
(Method)	**(RAM 081/03)**
Commodities:	**Root vegetables, Leafy vegetables, Legume vegetables, Fruiting vegetables, Pome fruit, Stone fruit, Small fruits and berries, Cereal grains, Fodder and straw, Oilseed, Tropical seed, Citrus fruits and Brassicae (cauliflower)**
Analytes:	**lambda-cyhalothrin**
LOQ:	**0.01 mg/kg**
Determination:	**GC-ECD (GC-MS in SIM-mode for confirmation)**
Description:	**see RAM 081 & RAM 081/01. Instead of internal standard external recoveries were used.**
Reference:	**Crook, 1998**
(Method)	**(RAM 081/05)**
Second validation:	**Gill, 1998**
Commodities:	**Carrots, Kiwi, Leek, Onion, Pea seeds and Tomato**
	(additional validation data from residue trails: Apple, Cabbage, Cherry, fodder beet, Lettuce, Melon, Pea pods, Peach, Potato, Strawberry, Sugar beet, Sweet Pepper, Tomato and Wheat)

Analytes:	**lambda-cyhalothrin**
LOQ:	**0.01 mg/kg**
Determination:	**GC-ECD or GC-MS**
Description:	**Samples are extracted by high speed maceration with acetone:hexane (50:50 v/v). Ultra-pure water is added and lambda-cyhalothrin is partitioned into the hexane layer. Samples are centrifuged to separate the hexane layer from particulate material and the aqueous layer, and an aliquot is removed. Samples are subjected to a solid phase clean-up using a silica column. Ether/hexane eluates are blown to dryness and re-suspended in hexane for final determination by GC-ECD or, if interfering co-extractives are found, by GC-MS. For leek and onion analysis, the use of GC-MS is required.**
Reference:	**Crook, 1998a**
(Method)	**(RAM 302/01)**
Second validation:	**Gill, 1998a**
Commodities:	**Hops, Dry beans and Wheat grain**
Analytes:	**lambda-cyhalothrin**
LOQ:	**0.01 mg/kg**
Determination:	**GC-MS**
Description:	**For hops analysis, samples are extracted by high speed maceration with acetone:hexane (50:50 v/v) and centrifuged to separate the hexane layer from particulate material. An aliquot is removed and partitioned with 0.1 M sodium hydroxide solution. Samples are subjected to a solid phase clean-up using a silica column. Ether/hexane eluates are blown to dryness and re-suspended in hexane for final determination by GC-MS. For dry crop analysis, the procedure is exactly as described above, but the partition with 0.1 M sodium hydroxide solution is omitted.**
Reference:	**Crook, 1998b**
(Method)	**(RAM 311/01)**
Second validation:	**Gill, 1998b**
Commodities:	**Oilseed rape, Soya beans and Olives**
Analytes:	**lambda-cyhalothrin**
LOQ:	**0.01 mg/kg**
Determination:	**GC-MS**
Description:	**Samples are extracted by high speed maceration with acetone:hexane (50:50 v/v), they are then centrifuged and an aliquot is taken. The aliquot is subjected to a solid phase clean-up using a silica column. Ether/hexane eluates are blown to dryness and re-suspended in hexane for final determination by GLC with mass selective detection (MS).**
Reference:	**Coleman, 2000**
(Method)	**(CCRL-MTH23 Rev.1)**
Additional studies:	**Edinger, 2002 (tomato validation)**
Commodities:	**Tomato, Pasture grasses and forage**
Analytes:	**lambda-cyhalothrin and enantiomeric pair A**
LOQ:	**0.01 mg/kg**
Determination:	**GC-ECD**
Description:	**Lambda-cyhalothrin and enantiomeric pair A residues were extracted by maceration in the presence of 50% acetone:hexane and the organic extracts**

	washed with water to remove acetone. After filtration the sample extract was partitioned two times with a mixture of sodium chloride solution and de-ionised water. After drying, the organic phase extract was submitted to Florisil clean-up. Lambda-cyhalothrin and enantiomeric pair A residues were quantitatively determined by GC-ECD.
Reference:	**Francis, 1990 & 1991 and McKay, 1990**
(Method)	**(HAS A030.009)**
Commodities:	**Broccoli, Tomatoes and Wheat**
Analytes:	**lambda-cyhalothrin, enantiomeric pair A, compounds Ia, V and VI**
LOQ:	**0.01 mg/kg (lambda-cyhalothrin)**
Determination:	**GC-ECD**
Description:	**Samples were extracted with 1:1 (v/v) acetone:hexane and filtered, followed by rotary evaporation under vacuum to remove the extracting solvents. The residues were re-dissolved in hexane prior to acetonitrile liquid-liquid column clean-up, followed by Florisil adsorption column chromatography to remove endogenous materials. Final quantitative determination was by capillary GLC-ECD.**
Reference:	**Francis, 1991a**
(Method)	**(HAS A030.006)**
Commodities:	**Maize**
Analytes:	**lambda-cyhalothrin, enantiomeric pair A, compounds Ia, V and VI**
LOQ:	**0.01 mg/kg (lambda-cyhalothrin)**
Determination:	**GC-ECD**
Description:	**Samples were extracted with 1:1 (v/) acetone:hexane, followed by acetone removal by partitioning with de-ionised water. Co-extracted lipids were removed by acetonitrile liquid-liquid column clean-up, followed by Florisil adsorption column chromatography to remove endogenous materials. Final quantitative determination was by GLC- ECD and external standardisation.**
Reference:	**Doran, 1999**
(Method)	**Independent laboratory validation for RAM 081/05, RAM 302/01 and RAM 311/01**
Commodities:	**Peaches, Soya beans, Grain, Straw**
Analytes:	**lambda-cyhalothrin**
LOQ:	**0.01 mg/kg**
Determination:	**GC-MS**
Description:	**see specific methods**

Table 40 Recoveries of cyhalothrin or lambda-cyhalothrin and its major metabolites in samples of plant origin

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	No.	Range of recoveries (%)		Matrix/Analyte
					Low	High	
RAM 081 & 081/2 (Swaine, 1984)	0.1	105	11	8	84	117	Root vegetables
	0.2	106	-	1	106	106	
	0.05	114	-	1	114	114	Leafy vegetables
	0.1	92	18	6	78	117	

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	No.	Range of recoveries (%) Low	High	Matrix/Analyte
	0.1	nr	nr	3	74	108	Legume vegetables
	0.05 0.2	117 104	- -	117 104	117 104	1 1	Fruiting vegetables
	0.1 0.2	97 nr	10 nr	88 84	111 96	8 3	Pome fruit
	0.1	nr	nr	85	99	2	Stone fruits
	0.1 0.2	nr 101	nr -	97 101	105 101	3 1	Small fruits and berries
	0.1 0.2	nr 105	nr -	94 105	103 105	3 1	Cereal grains
	0.1 0.2	98 nr	7 nr	87 77	109 113	10 3	Fodder and straw
	0.05 0.1	84 nr	8 nr	80 76	109 93	3 7	Oilseed
	0.05 0.1	91 82	- -	91 82	91 82	1 1	Tropical seed
RAM 081/02 (Sapiets, 1994)	0.05 0.1 0.2	102 105 nr	13 11 nr	82 84 106	123 116 106	6 8 1	Root vegetables
	0.05 0.1	nr 92	nr nr	114 78	114 117	1 6	Leafy vegetables
	0.05 0.1	101 nr	20 nr	74 74	121 108	5 3	Legume vegetables
	0.05 0.2 0.1 0.2 0.1	nr nr 97 nr nr	nr nr 10 nr -	117 104 88 84 85	117 104 111 96 99	1 1 8 3 2	Fruiting vegetables
	0.05 0.1 0.2	- nr -	- nr -	92 97 101	92 105 101	1 3 1	Small fruits and berries
	0.05 0.1 0.2	90 nr -	6 nr -	89 94 105	97 103 105	5 3 1	Cereal grains
	0.05 0.1 0.2	- 98 nr	- 7 nr	85 87 77	85 109 113	1 10 3	Fodder and straws
	0.05 0.1	nr 84	nr 8	80 76	109 93	3 7	Oilseed
	0.05 0.1	- -	- -	91 82	91 82	1 1	Tropical seeds

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	No.	Range of recoveries (%)		Matrix/Analyte
					Low	High	
	0.05 0.1	nr nr	- -	94 77	105 94	2 2	Citrus fruits
	0.05 0.1	nr 98	nr 16	77 73	92 116	4 13	Brassicae (cauliflower)
RAM 081/05 (Crook, 1998 & Gill, 1998)	0.01 0.10 1.0	nr nr nr	4 9 -	4 3 2	107 81 96	118 96 101	Kiwi
	0.01 0.10 1.0	nr nr nr	12 6 5	9 4 3	81 90 98	102 109 102	Carrot
	0.01 0.10 1.0	nr nr nr	13 3 2	4 3 2	60 82 94	82 86 97	Onion
	0.01 0.10 1.0	nr nr nr	6 4 -	9 4 3	79 87 91	90 93 93	Leek
	0.01 0.1	nr nr	4 5	3 3	92 95	100 104	Pea seeds
	0.01 0.1	nr nr	27 6	3 3	79 86	134 96	Tomato
	0.02 0.05 0.5	nr nr nr	- 8 1	2 3 2	96 91 90	98 117 91	Pome fruit[a]
	0.05 0.1	- -	- -	1 1	104 108	104 108	Peaches[a]
	0.05 0.1	- -	- -	1 1	87 83	87 83	Cherries[a]
	0.02 0.05	nr nr	6 8	4 4	89 74	102 97	Strawberries[a]
	0.02 0.05	nr nr	5 14	4 4	89 74	100 103	Potatoes[a]
	0.05 0.2	nr nr	- -	2 2	97 108	103 109	Cabbage[a]
	0.2 0.5 1.0	- - nr	- - -	1 1 2	96 117 100	96 117 101	Lettuce[a]
	0.05 0.1	nr nr	- 4	2 4	111 90	115 97	Pea pods & seeds[a]
	0.05	nr	5	8	90	102	Tomatoes[a]
	0.02 0.05	nr nr	11 4	3 3	77 88	103 96	Sweet peppers[a]

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	No.	Range of recoveries (%)		Matrix/Analyte
					Low	High	
	0.02	-	-	1	77	77	Melons[a]
	0.05	nr	-	2	66	105	
	0.1	-	-	1	98	98	
	0.2	106	-	2	102	110	Wheat straw[a]
	0.2	103	5	2	99	100	Wheat fodder[a]
	0.2	98	6	2	103	111	Wheat plant$_a$
RAM 302/01 (Crook, 1998a & Gill, 1998a)	0.01	97	10	4	91	108	Hops
	0.1	89	-	2	79	98	
	1.0	109	-	2	103	114	
	0.01	94	14	4	77	108	Dry beans
	0.1	89	-	2	86	91	
	1.0	94	-	2	93	95	
	0.01	105	6	4	98	113	Wheat grain
	0.1	98	-	2	95	100	
	1.0	105	-	2	103	106	
RAM 311/01 (Crook, 1998b & Gill, 1998b)	0.01	106	14	4	90	125	Oilseed rape
	0.1	86	-	2	82	89	
	1.0	96	-	2	94	98	
	0.01	89	3	4	87	92	Soya beans
	0.1	104	-	2	99	109	
	1.0	85	-	2	74	95	
	0.01	104	7	4	96	114	Olives
	0.1	96	-	2	93	99	
	1.0	106	-	2	106	106	
CCRL-MTH23 Rev.1 (Coleman, 2000 & Ediger, 2002)	0.003	nr	nr	10	75	122	Tomatoes[a]
	0.017	nr	-	2	110	115	
	0.034	nr	-	2	116	123	
	0.172	nr	-	2	98	102	
	0.334	nr	nr	4	99	108	
HAS A030.009 (Francis, 1990 & 1991 and McKay, 1990)	0.013	nr	nr	4	91	106	Broccoli[a]
	0.025	nr	nr	3	93	100	
	0.064	nr	nr	3	76	117	
	0.11	nr	-	1	87	87	
	0.13	nr	17	5	75	113	
	0.53	nr	-	2	68	99	
	1.3	nr	-	1	83	83	
	12.7	nr	-	1	74	74	
	0.013	nr	nr	3	91	121	Tomatoes[a]
	0.021	nr	nr	4	75	95	
	0.025	nr	nr	3	85	114	
	0.064	nr	nr	3	96	106	
	0.13	nr	nr	3	101	133	
	2.12	nr	nr	3	84	99	
	0.013	nr	nr	3	84	97	Wheat grain[a]

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	No.	Range of recoveries (%)		Matrix/Analyte
					Low	High	
	0.021	94	19	7	76	124	
	0.025	nr	nr	3	80	123	
	0.042	nr	-	1	73	73	
	0.064	nr	nr	3	76	111	
	0.13	nr	nr	3	91	113	
	0.21	94	18	5	77	112	
	2.1	nr	nr	4	83	98	
	0.013	nr	nr	3	79	97	Wheat forage[a]
	0.021	86	11	7	73	96	
	0.025	nr	nr	3	72	98	
	0.064	nr	nr	3	78	91	
	0.13	nr	nr	3	77	111	
	0.21	85	23	6	66	122	
	2.1	86	18	6	76	116	
	0.013	nr	nr	2	115	117	Wheat straw[a]
	0.021	92	15	6	77	109	
	0.025	nr	nr	2	78	90	
	0.026	nr	--	1	98	98	
	0.05	nr	--	1	112	112	
	0.064	nr	--	2	82	127	
	0.13	nr	nr	3	73	125	
	0.21	80	15	6	67	93	
	0.25	nr	--	1	92	92	
	2.1	nr	nr	4	71	106	
HAS A030.006 (Francis, 1991a)	0.013	93	13	11	69	109	Maize grain[a]
	0.042	nr	-	2	82	92	
	0.064	nr	nr	3	79	97	
	0.042	80	22	5	57	101	Maize silage[a]
	0.42	90	20	5	72	114	
	4.2	nr	nr	3	94	119	
	0.013	nr	nr	4	69	109	Maize fodder[a]
	0.042	nr	-	2	99	121	
	0.42	nr	-	2	81	97	
	2.1	nr	-	1	80	80	
	0.013	nr	-	1	129	129	Maize forage[a]
	0.021	nr	-	1	77	77	
	0.042	95	25	6	66	133	
	0.42	107	18	6	88	137	
	2.1	nr	-	1	92	92	
	4.2	nr	nr	3	80	107	
ILV for RAM 081/05, RAM 302/01 and RAM 311/01 (Doran, 1999)	0.01	93	3	3	90	95	Peaches
	0.1	94	5	3	92	99	
	0.01	86	12	2	79	93	Soya beans
	0.1	87	6	3	81	92	
	0.01	90	2	3	88	91	Grain
	0.1	90	11	3	84	101	

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	No.	Range of recoveries (%) Low	High	Matrix/Analyte
	0.01 0.1	86 96	18 9	2 3	75 87	97 103	Straw

nr not reported

[a] based on residue study

Samples of animal origin

The analytical methods for samples of animal origin are summarised below, including the commodities, for which the methods were validated, analytes and their LOQs, determination technique and a brief description of the method. Recoveries are shown in Table 41.

Reference:	**Sapiets 1985 & 1993**
(Method)	**(RAM 086 + RAM 086/01)**
Commodities:	**Bovine muscle, fat, kidney, liver and milk**
Analytes:	**lambda-cyhalothrin**
LOQ:	**0.01 mg/kg (tissues) and 0.005 mg/kg (milk)**
Determination:	**GC-ECD or GC-MS**
Description:	**Samples which have been accurately fortified with the internal standard (R171554) are extracted by maceration with 50% v/v acetone:hexane. The organic extracts are washed with water to remove acetone and co-extracted lipids are removed by liquid-liquid partition chromatography. All samples are subjected to adsorption chromatography to remove interfering endogenous materials. Final quantitative determination is by GC-ECD or GC-MS and internal standardisation.**
Reference:	**Sapiets 1986 & 1993**
(Method)	**(RAM 086/02)**
Commodities:	**Hens muscle, liver, skin, fat and eggs**
Analytes:	**lambda-cyhalothrin**
LOQ:	**0.01 mg/kg (tissues) and 0.005 mg/kg (eggs)**
Determination:	**GC-ECD or GC-MS**
Description:	**see RAM 086 + RAM 086/01**
Reference:	**Clarke, 2001**
(Method)	**(DFG S19)**
Commodities:	**Bovine muscle and eggs**
Analytes:	**lambda-cyhalothrin**
LOQ:	**0.01 mg/kg (eggs) and 0.05 mg/kg (bovine muscle)**
Determination:	**GC-ECD**
Description:	**Residues of lambda-cyhalothrin are extracted by maceration in acetone followed by further maceration after the addition of sodium chloride, ethyl acetate/cyclohexane (1:1, v/v) and ultra-pure water. An organic aliquot is taken and filtered through a sodium sulphate plug, and rinsed with ethyl acetate/cyclohexane (1:1, v/v). The extract and rinses are combined in a round bottomed flask and rotary evaporated to an aqueous residue. Aliquots are reconstituted in ethyl acetate. A 1:1 mixture of anhydrous sodium sulphate and sodium chloride and cyclohexane is**

added and the extract shaken and filtered. An aliquot is taken to dryness and re-dissolved in ethyl acetate/cyclohexane (1:1, v/v). This fraction is then subjected to a gel permeation chromatography clean-up procedure. Residues are determined by GC-ECD.

Table 41 Recoveries of cyhalothrin or lambda-cyhalothrin and its major metabolites in samples of animal origin

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	No.	Range of recoveries (%)		Matrix/Analyte
					Low	High	
RAM 086 & 086/01 (Sapiets, 1985 & 1993)	0.005	79	-	2	74	84	Bovine milk
	0.01	118	-	2	107	129	
	0.02	75	-	2	71	79	
	0.03	82	-	2	66	98	
	0.05	92	19	3	81	113	
	0.1	86	16	3	72	100	
	0.2	93	28	3	76	123	
	0.3	105	-	1	105	105	
	0.4	107	-	1	107	107	
	0.5	99	8	3	94	108	
	0.05	72	-	2	67	76	Bovine muscle
	0.1	113	16	3	97	132	
	0.15	84	-	1	84	84	
	0.2	92	-	2	79	104	
	0.25	60	-	1	60	60	
	0.3	126	-	1	126	126	
	0.5	85	-	1	85	85	
	1.0	86	-	1	86	86	
	0.1	85	-	2	69	100	Bovine kidney
	0.2	87	-	2	73	100	
	0.3	101	-	1	101	101	
RAM 086/02 (Sapiets 1986 & 1993)	0.05	87	17	3	74	101	Bovine liver
	0.1	102	-	1	102	102	
	0.15	91	-	1	91	91	
	0.2	88	-	1	88	88	
	0.3	65	-	1	65	65	
	0.5	103	-	1	103	103	
	1.0	118	-	1	118	118	
	0.2	91	-	1	91	91	Bovine fat
	0.5	62	-	1	62	62	
	2.0	79	-	1	79	79	
	5.0	102	-	1	102	102	
	0.005	88	21	8	66	118	Hens eggs
	0.01	101	44	3	57	145	
	0.02	56	-	1	56	56	
	0.05	85	-	2	73	97	
	0.10	99	41	6	49	143	
	0.20	86	39	3	61	125	
	0.005	105	-	2	72	137	Hens muscle
	0.01	79	-	2	79	79	

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	No.	Range of recoveries (%)		Matrix/Analyte
					Low	High	
	0.04	84	-	1	84	84	
	0.10	98	-	1	98	98	
	0.005	74	30	3	44	88	
	0.01	94	-	1	94	94	Hens liver
	0.02	87	-	1	87	87	
	0.005	65	-	1	65	65	
	0.01	125	-	1	125	125	Hens skin and subcutaneous fat
	0.05	103	-	1	103	103	
	0.10	55	-	1	55	55	
	0.01	103	-	1	103	103	
	0.02	88	-	1	88	88	
	0.05	89	-	1	75	103	Hens abdominal fat
	0.20	101	-	2	101	101	
	0.50	90	-	1	90	90	
DFG S19 (Clarke, 2001)	0.01	102	9	5	93	116	Hens eggs
	0.1	102	9	5	98	112	
	0.05	96	10	5	85	107	Bovine muscle
	0.5	89	13	5	77	107	

Stability of pesticides in stored analytical samples

The Meeting received information on the stability of residues of lambda-cyhalothrin in the plant and animal commodities. Residues were stable in each case up to 26 month. A summary of the data is presented in Table 42.

Reference:	**Tummon, 1988**
Commodities:	**Peach, pea, oilseed rape, wheat grain, sugar beet roots, cotton seed, apple, cabbage and potato**
Analytes:	**lambda-cyhalothrin**
Material and Method:	**Duplicate samples were fortified at 0.5 mg/kg and were re-analysed after storage at <-18 °C at 0 days, then every three months up to and including one year and finally after 26 months. This was followed by further re-analysis of the extracts after storage in a cold room at < 4 °C for approximately six weeks. Analysis was conducted according to GLC method RAM 081 using internal standards.**
Reference:	**Burke, 1988**
Commodities:	**Apple and cabbage**
Analytes:	**lambda-cyhalothrin & its epimere R157836**
Material and Method:	**Samples of soil were also analysed but are not considered further here. Samples were fortified with 1.0 mg/kg cyhalothrin, analysed at zero time and then stored at -20 °C. Replicate samples of apple and cabbage were removed and re-analysed at intervals of 3 months up to and including nine months, and then after 16 months. Samples were analysed for lambda-cyhalothrin and its epimere R157836 according to gas-liquid chromatography (GLC) method RAM 070 using internal standards.**

Reference:	**Sapiets, 1985b**
Commodities:	**Bovine fat, muscle, kidney and liver**
Analytes:	**lambda-cyhalothrin**
Material and Method:	**Samples of fat, muscle, kidney and liver from a residue transfer study which had been previously analysed for lambda-cyhalothrin residues were re-analysed in duplicate after storage at -20 ± 2 °C for a period of nine weeks. Analysis was done according to GLC method RAM 086.**
Reference:	**Sapiets, 1985c**
Commodities:	**Milk**
Analytes:	**lambda-cyhalothrin**
Material and Method:	**Duplicate samples of untreated milk were fortified at 0.2 mg/kg with lambda-cyhalothrin. Samples were stored at -20 ± 2 °C and removed for analysis at 0, 2, 4, 8 and 16 weeks. Analysis was done according to GLC method RAM 081.**
Reference:	**Sapiets, 1986a**
Commodities:	**Poultry muscle, liver, fat and eggs**
Analytes:	**lambda-cyhalothrin**
Material and Method:	**Samples of poultry tissues and eggs from a residue transfer study which had been previously analysed for lambda-cyhalothrin were re-analysed in duplicate after storage at -20 ± 2 °C for a period of three months. Analysis was done according to GLC method RAM 086.**
Reference:	**Sapiets, 1987**
Commodities:	**Poultry muscle, liver, fat and eggs**
Analytes:	**lambda-cyhalothrin**
Material and Method:	**Samples of poultry tissues and eggs from a residue transfer study which had been previously analysed for lambda-cyhalothrin residues were re-analysed in duplicate after storage at <-18 °C for a period of two years. Analysis was done according to GLC method RAM 086.**

Table 42 Freezer storage stability of lambda-cyhalothrin residues in plant and animal commodities

Reference (Author, Year)	Storage interval (months)	Residue found (mg/kg)	Recovery (% fortification)	Mean recovery (% fortification)	Matrix
Tummon, 1988	0	0.5, 0.5	-	-	Peach
	3	0.42, 0.48	84, 96	90	
	6	0.47, 0.46	94, 88	91	
	9	0.49, 0.47	98, 94	96	
	12	0.34, 0.47	68, 94	81	
	26	0.54, 0.55	108, 110	109	
	0	0.5, 0.5	-	-	Pea
	3	0.44, 0.49	88, 98	93	
	6	0.47, 0.47	94, 94	94	
	9	0.46, 0.49	92, 98	95	
	12	0.49, 0.48	98, 96	97	
	26	0.57, 0.58	114, 116	115	
	0	0.5. 0.5	-	-	Oilseed rape
	3	0.47, 0.46	94, 92	93	
	6	0.47, 0.48	94, 96	95	
	9	0.43, 0.47	86, 94	90	
	12	0.48, 0.47	96, 94	95	

Reference (Author, Year)	Storage interval (months)	Residue found (mg/kg)	Recovery (% fortification)	Mean recovery (% fortification)	Matrix
	26	0.58, 0.56	116, 112	114	
	0 3 6 9 12 26	0.49, 0.51 0.42, 0.37 0.45, 0.42 0.39, 0.37 0.46, 0.44 0.6, 0.59	- 86, 73 92, 82 80, 73 94, 86 122, 116	- 80 87 77 90 119	Wheat grain
	0 3 6 9 12 26	0.49, 0.5 0.45, 0.5 0.47, 0.47 0.47, 0.49 0.5, 0.49 0.56, 0.57	- 92, 100 96, 94 96, 98 102, 98 114, 114	- 96 95 97 100 114	Sugar beet
	0 3 6 9 12 26	0.49, 0,51 0.44, 0.49 0.5, 0.51 0.47, 0.5 0.54, 0.52 0.63, 0.59	- 90, 96 102, 100 96, 98 110, 102 129, 116	- 93 101 97 106 123	Cotton seed
	0 26	0.5 [a], 0.5 [a] 0.53, 0.6	- 106, 120	- 113	Apple
	0 26	0.5 [a], 0.5 [a] 0.61, 0.56	- 122, 112	- 117	Cabbage
	0 12 26	0.5 [a], 0.5 [a] 0.47, 0.47 0.53, 0.5	- 94, 94 106, 100	- 94 103	Potato
Burke, 1988	0 3 6 9 16	0.43, 0.45 0.41 0.39, 0.4, 0.39 0.43, 0.44 0.38, 0.37, 0.41	- 93 87, 91, 97 98, 100 86, 84, 93	- 93 92 99 88	Apple (lambda-cyhalothrin)
	0 3 6 9 16	0.61, 0.62 0.57 0.55, 0.56, 0.54 0.68, 0.69 0.54, 0.53, 0.59	- 93 89, 91, 88 111, 112 88, 86, 96	- 93 89 112 90	Apple (epimere R157836)
	0 3 6 9 16	0.43, 0.47 0.41 0.43, 0.4, 0.41 0.46, 0.4 0.34, 0.39, 0.35	- 91 96, 89, 91 102, 89 76, 87, 78	- 91 92 96 80	Cabbage (lambda-cyhalothrin)
	0 3 6 9 16	0.61, 0.61 0.57 0.56, 0.56, 0.59 0.76, 0.61 0.48, 0.55, 0.5	- 93 92, 92, 97 125, 100 79, 90, 82	- 93 93 113 84	Cabbage (epimere R157836)
Sapiets, 1985b	0 3	0.13, 0.14 0.13, 0.13	- 96, 96	- 96	Bovine adductor muscle

Reference (Author, Year)	Storage interval (months)	Residue found (mg/kg)	Recovery (% fortification)	Mean recovery (% fortification)	Matrix
	0 3	0.38, 0.41 0.43, 0.44	- 109, 111	- 110	Bovine pectoral muscle
	0 3	0.43, 0.36 0.54, 0.58	- 137, 147	- 142	Bovine kidney
	0 3	0.06, 0.1 0.1, 0.1	- 125, 125	- 125	Bovine liver
	0 3	4.6, 3.9 4.5, -[b]	- 106, -	- 106	Bovine subcutaneous fat
	0 3	6.5, 7.9 6.2, 6.5	- 86, 90	- 88	Bovine peritoneal fat
Sapiets, 1985c	0 0.5 1 3 5	0.2, 0.2 0.21, 0.22 0.2, 0.2 0.2, 0.2 0.22, 0.21	- 105, 110 100, 100 100, 100 110, 105	- 108 100 100 108	Bovine milk
Sapiets, 1986a	0 1 3	0.21, 0.21 0.2, 0.2 0.18, 0.2	- 95, 95 86, 95	- 95 91	Poultry muscle
	0 1 3	0.20, 0.21 0.17, 0.2 0.16, 0.21	- 83, 98 78, 102	- 91 90	Poultry liver
	0 1 3	0.2, 0.21 0.19, 0.19 0.18, 0.19	- 93, 93 88, 93	- 93 91	Poultry subcutaneous fat and skin
	0 1 3	0.2, 0.2 0.19, 0.19 0.18, 0.18	- 95, 95 90, 90	- 95 90	Poultry abdominal fat
	0 1 3	0.21, 0.21 0.22, 0.22 0.19, 0.19	- 105, 105 88, 88	- 105 88	Poultry eggs
Sapiets, 1987	0 25	0.06, 0.06 0.07, 0.07	- 117, 117	- 117	Poultry eggs
	0 25	0.02, 0.02, 0.04, 0.05 0.02, 0..04	- 66, 133	- 100	Poultry muscle
	0 25	0.003, 0.004, 0.007, 0.006 0.003, 0.005	- 60, 100	- 80	Poultry liver
	0 27	0.08, 0.08, 0.09, 0.09 0.1, 0.11	- 118, 129	- 124	Poultry fat

a residue not measured. Nominal level of stocking solution

b sample lost during work-up

USE PATTERN

Lambda-cyhalothrin is an insecticide from the group of pyrethroids. Action is mainly as a contact insecticide. Lambda-cyhalothrin has a broad spectrum of activity against numerous species of insects. Formulations containing lambda-cyhalothrin are registered for use on a wide variety of crops worldwide. Registered uses include use as a foliar spray on vegetables, citrus, tree fruits, cotton, soya and other oilseed crops and cereals.

Table 43 List of registered uses

Crop	Country	Application details						
		Form	Type	kg ai/ha	kg ai/hL	L/ha	No.	Pre harvest interval (PHI) in days
Alfalfa	France	CS 10	foliar	0.008			2	7
Alfalfa	Portugal	CS 10	foliar		0.001			7
Alfalfa	Spain	WG 2.5	foliar	0.020				7
Alfalfa	USA	CS 12	foliar, aerial	0.034		min. 20	4	1(forage) 7(hay)
Alfalfa	USA	CS 12	foliar	0.034		min. 100	4	1(forage) 7(hay)
Almonds	France	CS 10	foliar		0.002		2	7
Almonds	Italy	CS 10	foliar		0.003			7
Almonds	Spain	WG 2.5	foliar	0.020				7
Almonds	USA	CS 12	foliar, aerial	0.045		min. 50		14
Almonds	USA	CS 12	foliar	0.045				14
Apples	France	CS 10	foliar		0.002		2	7
Apples	Italy	CS 10	foliar		0.004			7
Apples	Portugal	CS 10	foliar		0.001			7
Apples	USA	CS 12	foliar, aerial	0.045		min. 50		21
Apples	USA	CS 12	foliar	0.045				21
Apricots	France	CS 10	foliar		0.002		2	7
Apricots	Italy	CS 10	foliar		0.004			7
Apricots	Portugal	CS 10	foliar		0.001			7
Apricots	USA	CS 12	foliar, aerial	0.045		min. 50		14
Apricots	USA	CS 12	foliar	0.045				14
Artichoke	Italy	CS 10	foliar	0.013	0.003			7
Asparagus	France	CS 10	foliar	0.013			2	90
Asparagus	Thailand	EC 25	foliar	0.018	0.003	750		3
Aubergine	France	CS 10	foliar	0.013			2	3
Aubergine	Italy	CS 10	foliar	0.013	0.003			3
Aubergine	USA	CS 12	foliar, aerial	0.034		min. 20		5
Aubergine	USA	CS 12	foliar	0.034				5

Crop	Country	Application details						
		Form	Type	kg ai/ha	kg ai/hL	L/ha	No.	Pre harvest interval (PHI) in days
Barley	Australia	EC 25	foliar	0.010				14
Barley	Italy	CS 10	foliar	0.015	0.003			30
Barley	Portugal	CS 10	foliar	0.008				28
Beans	Portugal	CS 10	foliar		0.002			7
Beans, green	Spain	WG 2.5	foliar	0.020	0.002			7
Beech nuts	USA	CS 12	foliar, aerial	0.045		min. 50		14
Beech nuts	USA	CS 12	foliar	0.045				14
Beet crops	France	CS 10	foliar	0.008			1	7
Beetroot	Portugal	CS 10	foliar		0.002			7
Beetroot	Spain	WG 2.5	foliar	0.015	Spain			90
Brassicas	Australia	EC 25	foliar	0.009				2
Brazil nuts	USA	CS 12	foliar	0.045				14
Brazil nuts	USA	CS 12	foliar, aerial	0.045		min. 50		14
Broad beans	Italy	CS 10	foliar	0.013	0.003			7
Broad beans	USA	CS 12	foliar, aerial	0.034		min. 20		7 (legume vegetable) 21 (pulses)
Broad beans	USA	CS 12	foliar	0.034				7 (legume vegetable) 21 (pulses)
Broccoli	Australia	EC 25	foliar	0.009				2
Broccoli	Italy	CS 10	foliar	0.013	0.003			7
Broccoli	Portugal	CS 10	foliar	0.008	0.002			3
Broccoli	Spain	WG 2.5	foliar	0.020				3
Broccoli	USA	CS 12	foliar, aerial	0.034		min. 20		1
Broccoli	USA	CS 12	foliar	0.034				1
Brussels sprouts	Australia	EC 25	foliar	0.009				2
Brussels sprouts	Italy	CS 10	foliar	0.013	0.003			7
Brussels sprouts	Portugal	CS 10	foliar	0.008	0.002			3
Brussels sprouts	Spain	WG 2.5	foliar	0.020				7
Brussels sprouts	USA	CS 12	foliar	0.034				1
Brussels sprouts	USA	CS 12	foliar, aerial	0.034		min. 20		1
Bulb vegetables	Spain	WG 2.5	foliar	0.020				7
Butternuts	USA	CS 12	foliar	0.045				14
Butternuts	USA	CS 12	foliar, aerial	0.045		min. 50		14
Cabbage	Australia	EC 25	foliar	0.009				2

Crop	Country	Application details						
		Form	Type	kg ai/ha	kg ai/hL	L/ha	No.	Pre harvest interval (PHI) in days
Cabbage	France	CS 10	foliar	0.020			2	7
Cabbage	Italy	CS 10	foliar	0.013	0.003			7
Cabbage	Portugal	CS 10	foliar	0.008	0.002			3
Cabbage	Spain	WG 2.5	foliar	0.020				3
Cabbage	USA	CS 12	foliar, aerial	0.034		min. 20		1
Cabbage	USA	CS 12	foliar	0.034				1
Carrots	France	CS 10	foliar	0.013			4	14
Carrots	Italy	CS 10	foliar	0.013	0.003			3
Cashew	USA	CS 12	foliar	0.045				14
Cashew	USA	CS 12	foliar, aerial	0.045		min. 50		14
Cauliflower	Australia	EC 25	foliar	0.009				2
Cauliflower	Italy	CS 10	foliar	0.013	0.003			7
Cauliflower	Portugal	CS 10	foliar	0.008	0.002			3
Cauliflower	Spain	WG 2.5	foliar	0.020				7
Cauliflower	USA	CS 12	foliar	0.034				1
Cauliflower	USA	CS 12	foliar, aerial	0.034		min. 20		1
Cavalo Brocolo	USA	CS 12	foliar	0.034				1
Cavalo Brocolo	USA	CS 12	foliar, aerial	0.034		min. 20		1
Celeriac	Spain	WG 2.5	foliar	0.020				3
Celery	France	CS 10	foliar	0.013			2	7
Celery	Italy	CS 10	foliar	0.013	0.003			7
Celery	Spain	WG 2.5	foliar	0.020				3
Cereals	France	CS 10	foliar	0.008			3	28
Cereals	Spain	WG 2.5	foliar	0.020				30
Chard	Italy	CS 10	foliar	0.013	0.003			10
Cherries	France	CS 10	foliar		0.002		2	7
Cherries	Italy	CS 10	foliar		0.004			7
Chestnuts	France	CS 10	foliar		0.001		2	7
Chestnuts	USA	CS 12	foliar	0.045				14
Chestnuts	USA	CS 12	foliar, aerial	0.045		min. 50		14
Chick peas	Australia	EC 25	foliar	0.009				7
Chick peas	USA	CS 12	foliar	0.034				21

Crop	Country	Application details						
		Form	Type	kg ai/ha	kg ai/hL	L/ha	No.	Pre harvest interval (PHI) in days
Chick peas	USA	CS 12	foliar, aerial	0.034		min. 20		21
Chicksaw plum	USA	CS 12	foliar	0.045				14
Chicksaw plum	USA	CS 12	foliar, aerial	0.045		min. 50		14
Chicory	Italy	CS 10	foliar	0.013	0.003			7
Chinese Broccoli	USA	CS 12	foliar	0.034				1
Chinese Broccoli	USA	CS 12	foliar, aerial	0.034		min. 20		1
Chinese Cabbage	USA	CS 12	foliar	0.034				1
Chinese Cabbage	USA	CS 12	foliar, aerial	0.034		min. 20		1
Chinese mustard cabbage	USA	CS 12	foliar	0.034				1
Chinese mustard cabbage	USA	CS 12	foliar, aerial	0.034		min. 20		1
Chinquapin	USA	CS 12	foliar	0.045				14
Chinquapin	USA	CS 12	foliar, aerial	0.045		min. 50		14
Citrus	France	CS 10	foliar		0.002		2	7
Citrus	Portugal	CS 10	foliar		0.001			7
Citrus	Spain	WG 2.5	foliar		0.002			7
Colza	Italy	CS 10	foliar	0.013	0.003			15
Cotton	Australia	EC 25	foliar	0.022				21
Cotton	Italy	CS 10	foliar	0.013	0.003			15
Cotton	Spain	WG 2.5	foliar	0.020	Spain			30
Cotton	USA	CS 12	foliar	0.045			10	21
Cotton	USA	CS 12	foliar, aerial	0.045			10	21
Courgettes	France	CS 10	foliar	0.008			2	3
Courgettes	Italy	CS 10	foliar	0.013	0.003			3
Crab-apple	USA	CS 12	foliar, aerial	0.045		min. 50		21
Crab-apple	USA	CS 12	foliar	0.045				21
Cruciferae	France	CS 10	foliar	0.008			2	28
Cucumbers	France	CS 10	foliar	0.008			2	3
Cucumbers	Italy	CS 10	foliar	0.013	0.003			7
Cucurbitaceae	Spain	WG 2.5	foliar	0.020	0.002			3
Curly lettuce	France	CS 10	foliar	0.008			2	7
Currants	France	CS 10	foliar		0.002		2	21
Currants	Spain	WG 2.5	foliar	0.020				14

Crop	Country	Application details						
		Form	Type	kg ai/ha	kg ai/hL	L/ha	No.	Pre harvest interval (PHI) in days
Damson plum	USA	CS 12	foliar	0.045				14
Damson plum	USA	CS 12	foliar, aerial	0.045		min. 50		14
Dandelion	France	CS 10	foliar	0.008			2	7
Escarole	France	CS 10	foliar	0.008			2	7
Faba beans	Australia	EC 25	foliar	0.009				7
Fennel	France	CS 10	foliar	0.013			2	21
Fennel	Italy	CS 10	foliar	0.013	0.003			3
Field peas	Australia	EC 25	foliar	0.009				7
Figs	France	CS 10	foliar		0.001		1	30
Fodder plants	France	CS 10	foliar	0.008			2	7
Forage beet	Italy	CS 10	foliar	0.013	0.003			15
Fruit trees	Spain	WG 2.5	foliar		0.002			7
Garlic	France	CS 10	foliar	0.013			2	21
Garlic	Italy	CS 10	foliar	0.013	0.003			3
Garlic	USA	CS 12	foliar, aerial	0.034		min. 20		14
Garlic	USA	CS 12	foliar	0.034				14
Gherkins	France	CS 10	foliar	0.008			2	3
Grapes	Italy	CS 10	foliar		0.004			21
Grapes	Portugal	CS 10	foliar		0.002			7
Grapes	Spain	WG 2.5	foliar		0.003			7
Grapes (wine)	France	CS 10	foliar	0.040			2	7
Grassland	Italy	CS 10	foliar	0.013	0.003			15
Ground cherry	USA	CS 12	foliar, aerial	0.034		min. 20		5
Ground cherry	USA	CS 12	foliar	0.034				5
Guar	USA	CS 12	foliar, aerial	0.034		min. 20		21
Guar	USA	CS 12	foliar	0.034				21
Hazelnuts	France	CS 10	foliar		0.002		2	7
Hazelnuts	Italy	CS 10	foliar		0.003			7
Hazelnuts	Spain	WG 2.5	foliar	0.020	Spain			7
Hazelnuts	USA	CS 12	foliar	0.045				14
Hazelnuts	USA	CS 12	foliar, aerial	0.045		min. 50		14
Herbs	Spain	WG 2.5	foliar		0.002			7
Hickory nuts	USA	CS 12	foliar	0.045				14

Crop	Country	Application details						
		Form	Type	kg ai/ha	kg ai/hL	L/ha	No.	Pre harvest interval (PHI) in days
Hickory nuts	USA	CS 12	foliar, aerial	0.045		min. 50		14
Hops	Italy	CS 10	foliar		0.002			15
Hops	Spain	WG 2.5	foliar		0.002			7
Horse beans	France	CS 10	foliar	0.006			2	14
Jackbean	USA	CS 12	foliar, aerial	0.028		min. 20		7
Jackbean	USA	CS 12	foliar	0.028				7
Japanese plum	USA	CS 12	foliar	0.045				14
Japanese plum	USA	CS 12	foliar, aerial	0.045		min. 50		14
Kale	Portugal	CS 10	foliar	0.008	0.002			3
Kidney beans	Italy	CS 10	foliar	0.013	0.003			3
Kiwis	France	CS 10	foliar		0.001		1	21
Kiwis	Italy	CS 10	foliar		0.003			7
Kohlrabi	USA	CS 12	foliar	0.034				1
Kohlrabi	USA	CS 12	foliar, aerial	0.034		min. 20		1
Lablab beans	USA	CS 12	foliar	0.034				21
Lablab beans	USA	CS 12	foliar, aerial	0.034		min. 20		21
Leek	France	CS 10	foliar	0.008			2	7
Leek	Italy	CS 10	foliar	0.013	0.003			3
Lemons	Australia	EC 25	foliar		0.075			28
Lentils	Australia	EC 25	foliar	0.009				7
Lentils	France	CS 10	foliar	0.008			2	14
Lentils	Italy	CS 10	foliar	0.013	0.003			3
Lentils	USA	CS 12	foliar	0.034				21
Lentils	USA	CS 12	foliar, aerial	0.034		min. 20		21
Lettuce	France	CS 10	foliar	0.013			2	7
Lettuce (and similar)	Spain	WG 2.5	foliar	0.020				3
Lettuce (head and leaf)	USA	CS 12	foliar, aerial	0.034		min. 20		1
Lettuce (head and leaf)	USA	CS 12	foliar	0.034				1
Linseed	France	CS 10	foliar	0.008			3	35
Loquat	USA	CS 12	foliar, aerial	0.045		min. 50		21
Loquat	USA	CS 12	foliar	0.045				21
Lucerne	Australia	EC 25	foliar	0.010				14
Lucerne	Italy	CS 10	foliar	0.013	0.003			7

Crop	Country	Application details						
		Form	Type	kg ai/ha	kg ai/hL	L/ha	No.	Pre harvest interval (PHI) in days
Lupine species	USA	CS 12	foliar, aerial	0.034		min. 20		21
Lupine species	USA	CS 12	foliar	0.034				21
Lupins	Australia	EC 25	foliar	0.006				14
Macadamia nuts	USA	CS 12	foliar, aerial	0.045		min. 50		14
Macadamia nuts	USA	CS 12	foliar	0.045				14
Mache	France	CS 10	foliar	0.008			2	7
Maize	France	CS 10	foliar	0.020			2	60
Maize	Italy	CS 10	foliar	0.015	0.003			15
Maize	Portugal	CS 10	foliar	0.020				60
Maize	Spain	WG 2.5	foliar	0.020				30
Maize	USA	CS 12	In-furrow	0,007 kg/m row				21
Maize	USA	CS 12	foliar	0,034 (max. 0.13 kg/ha and season)				21 (grain, fodder, silage) 1 (grazing)
Maize	USA	CS 12	foliar, aerial	0,034 (max. 0.13 kg/ha and season)		min. 20		21 (grain, fodder, silage) 1 (grazing)
Mangoes	France	CS 10	foliar		0.002		2	7
Mangoes	Thailand	EC 25	foliar	0,125 (g per tree)	1.25 g/hl	10 (per tree)		8
Mangold	Italy	CS 10	foliar	0.013	0.003			10
Mayhaw	USA	CS 12	foliar	0.045				21
Mayhaw	USA	CS 12	foliar, aerial	0.045		min. 50		21
Melons	France	CS 10	foliar	0.020			2	3
Mung beans	Australia	EC 25	foliar	0.018				1 (legume vegetable) 14 (pulses)
Mustard	France	CS 10	foliar	0.008			3	35
Nashi pears	France	CS 10	foliar		0.002		2	7
Navy beans	Australia	EC 25	foliar	0.018				1 (legume vegetable) 14 (pulses)
Nectarine	Portugal	CS 10	foliar		0.001			7
Nectarine	USA	CS 12	foliar	0.045				14
Nectarine	USA	CS 12	foliar, aerial	0.045		min. 50		14
Oats	Italy	CS 10	foliar	0.015	0.003			30
Oats	Portugal	CS 10	foliar	0.008				28
Oilseed rape	Australia	EC 25	foliar	0.009				7
Oilseed rape	France	CS 10	foliar	0.008			3	28
Oilseed rape	Italy	CS 10	foliar	0.013	0.003			15

Crop	Country	Application details						
		Form	Type	kg ai/ha	kg ai/hL	L/ha	No.	Pre harvest interval (PHI) in days
Oilseed rape	Spain	WG 2.5	foliar	0.020				30
Oilseed rape	USA	CS 12	foliar, aerial	0.034		min. 20	3	7
Oilseed rape	USA	CS 12	foliar	0.034			3	7
Olive trees	Spain	WG 2.5	foliar		0.002			not stated
Olive trees (after harvest, before budding)	Portugal	CS 10	foliar		0.001			not possible
Olive trees (after harvest, before budding)	Spain	WG 2.5	foliar		0.002			not possible
Olives	France	CS 10	foliar		0.002		2	7
Onion	Italy	CS 10	foliar	0.013	0.003			3
Onion (bulb)	USA	CS 12	foliar, aerial	0.034		min. 20		14
Onion (bulb)	USA	CS 12	foliar	0.034				14
Onions	France	CS 10	foliar	0.008			2	21
Oranges	Australia	EC 25	foliar		0.075			28
Oranges	Italy	CS 10	foliar		0.002			7
Oriental Pear	USA	CS 12	foliar, aerial	0.045		min. 50		21
Oriental Pear	USA	CS 12	foliar	0.045				21
Parsley	France	CS 10	foliar	0.008			2	7
Pasture	Australia	EC 25	foliar	0.010				14
Peaches	France	CS 10	foliar		0.002		2	7
Peaches	Italy	CS 10	foliar		0.004			7
Peaches	Portugal	CS 10	foliar		0.001			7
Peaches	USA	CS 12	foliar, aerial	0.045		min. 50		14
Peaches	USA	CS 12	foliar	0.045				14
Peanut	Italy	CS 10	foliar	0.013	0.003			15
Peanut	USA	CS 12	foliar, aerial	0.034		min. 20		14
Peanut	USA	CS 12	foliar	0.034				14
Pears	France	CS 10	foliar		0.002		2	7
Pears	Italy	CS 10	foliar		0.004			7
Pears	Portugal	CS 10	foliar		0.003			7
Pears	USA	CS 12	foliar, aerial	0.045		min. 50		21
Pears	USA	CS 12	foliar	0.045				21
Peas, green	France	CS 10	foliar	0.008			2	3
Peas, green	Italy	CS 10	foliar	0.013	0.003			7

Crop	Country	Application details						
		Form	Type	kg ai/ha	kg ai/hL	L/ha	No.	Pre harvest interval (PHI) in days
Peas, green	Spain	WG 2.5	foliar	0.020	0.002			7
Pecan	USA	CS 12	foliar	0.045				14
Pecan	USA	CS 12	foliar, aerial	0.045		min. 50		14
Pepino	USA	CS 12	foliar	0.034				5
Pepino	USA	CS 12	foliar, aerial	0.034		min. 20		5
Pepperoni	Italy	CS 10	foliar	0.013	0.003			3
Peppers	France	CS 10	foliar	0.020			2	3
Peppers	Portugal	CS 10	foliar		0.002			3
Peppers	USA	CS 12	foliar	0.034				5
Peppers	USA	CS 12	foliar, aerial	0.034		min. 20		5
Phaseolus species (legume vegetables and pulses)	USA	CS 12	foliar, aerial	0.034		min. 20		7 (legume vegetable) 21 (pulses)
Phaseolus species (legume vegetables and pulses)	USA	CS 12	foliar	0.034				7 (legume vegetable) 21 (pulses)
Pigeon pea	USA	CS 12	foliar	0.034				7 (legume vegetable) 21 (pulses)
Pigeon pea	USA	CS 12	foliar, aerial	0.034		min. 20		7 (legume vegetable) 21 (pulses)
Pisum species (legume vegetables and pulses)	USA	CS 12	foliar, aerial	0.034		min. 20		7 (legume vegetable) 21 (pulses)
Pisum species (legume vegetables and pulses)	USA	CS 12	foliar	0.034				7 (legume vegetable) 21 (pulses)
Plumcot	USA	CS 12	foliar	0.045				14
Plumcot	USA	CS 12	foliar, aerial	0.045		min. 50		14
Plums	France	CS 10	foliar		0.002		2	7
Plums	Italy	CS 10	foliar		0.004			7
Plums	Portugal	CS 10	foliar		0.001			7
Plums	USA	CS 12	foliar, aerial	0.045		min. 50		14
Plums	USA	CS 12	foliar	0.045				14
Poppy seeds	France	CS 10	foliar	0.008			3	35
Potatoes	Australia	EC 25	foliar	0.006				7
Potatoes	France	CS 10	foliar	0.013			3	14
Potatoes	Italy	CS 10	foliar	0.013	0.003			15
Potatoes	Portugal	CS 10	foliar	0.008	0.002			14
Potatoes	Spain	WG 2.5	foliar	0.020				30
Prune	USA	CS 12	foliar	0.045				14

Crop	Country	Application details						
		Form	Type	kg ai/ha	kg ai/hL	L/ha	No.	Pre harvest interval (PHI) in days
Prune	USA	CS 12	foliar, aerial	0.045		min. 50		14
Pulses	France	CS 10	foliar	0.008			2	14
Pulses	Spain	WG 2.5	foliar	0.020				30
Quinces	France	CS 10	foliar		0.002		2	7
Quinces	USA	CS 12	foliar	0.045				21
Quinces	USA	CS 12	foliar, aerial	0.045		min. 50		21
Radicchios	Italy	CS 10	foliar	0.013	0.003			7
Radish	France	CS 10	foliar	0.005			4	7
Radish	Italy	CS 10	foliar	0.013	0.003			3
Radish	Spain	WG 2.5	foliar	0.020				3
Raspberries and other rubus	France	CS 10	foliar		0.002		2	14
Rice	USA	CS 12	foliar	0.045				21
Rice	USA	CS 12	foliar, aerial	0.045		min. 20		21
Root chicory (for coffee)	France	CS 10	foliar	0.013			2	14
Rucola	Italy	CS 10	foliar	0.013	0.003			7
Rye	Italy	CS 10	foliar	0.015	0.003			30
Shallots	France	CS 10	foliar	0.008			2	21
Small fruits and berries	Italy	CS 10	foliar		0.003			7
Solanacea	Spain	WG 2.5	foliar	0.020	0.002			3
Sorghum	Australia	EC 25	foliar	0.018				14
Sorghum	France	CS 10	foliar	0.015			2	14
Sorghum	Italy	CS 10	foliar	0.015	0.003			30
Sorghum	USA	CS 12	foliar	0.034				30
Sorghum	USA	CS 12	foliar, aerial	0.034		min. 20		30
Soya bean (immature)	Thailand	EC 25	foliar	0.016	0.003	625	2	8
Soya bean (immature)	USA	CS 12	foliar	0.028				7
Soya bean (immature)	USA	CS 12	foliar, aerial	0.028		min. 20		7
Soya beans	Australia	EC 25	foliar	0.018				21
Soya beans	France	CS 10	foliar	0.008			2	14
Soya beans	Italy	CS 10	foliar	0.013	0.003			15
Soya beans	USA	CS 12	foliar	0.034				30
Soya beans	USA	CS 12	foliar, aerial	0.034		min. 20		30
Spinach	France	CS 10	foliar	0.006			2	7

Crop	Country	Application details						
		Form	Type	kg ai/ha	kg ai/hL	L/ha	No.	Pre harvest interval (PHI) in days
Spinach	Italy	CS 10	foliar	0.013	0.003			10
Spinach (and similar)	Spain	WG 2.5	foliar	0.020				3
Strawberries	France	CS 10	foliar	0.013			2	3
Strawberries	Italy	CS 10	foliar		0.003			7
Strawberries	Spain	WG 2.5	foliar	0.020				3
String beans	Italy	CS 10	foliar	0.013	0.003			7
Sugar beet	Italy	CS 10	foliar	0.013	0.003			7
Sugar cane	USA	CS 12	foliar	0.045				21
Sugar cane	USA	CS 12	foliar, aerial	0.045		min. 20		21
Sunflower	Italy	CS 10	foliar	0.013	0.003			70
Sunflower	USA	CS 12	foliar	0.034				45
Sunflower	USA	CS 12	foliar, aerial	0.034		min. 20		45
Sunflowers	Australia	EC 25	foliar	0.018				28
Sweet and Tart Cherry	USA	CS 12	foliar, aerial	0.045		min. 50		14
Sweet and Tart Cherry	USA	CS 12	foliar	0.045				14
Sweet corn	USA	CS 12	In-furrow	0.007 kg/m row				21
Sweet corn	USA	CS 12	foliar, aerial	0,034 (max. 0.54 kg/ha and season)		min. 20		21 (fodder, silage) 1 (harvest and grazing)
Sweet corn	USA	CS 12	foliar	0.034 (max. 0.54 kg/ha and season)				21 (fodder, silage) 1 (harvest and grazing)
Sweetcorn	France	CS 10	foliar	0.020			2	7
Swordbean	USA	CS 12	foliar, aerial	0.028		min. 20		7
Swordbean	USA	CS 12	foliar	0.028				7
Tomatillo	USA	CS 12	foliar	0.034				5
Tomatillo	USA	CS 12	foliar, aerial	0.034		min. 20		5
Tomatoes	Australia	EC 25	foliar	0.015	0.001			1
Tomatoes	France	CS 10	foliar	0.013			2	3
Tomatoes	Italy	CS 10	foliar	0.013	0.003			3
Tomatoes	USA	CS 12	foliar, aerial	0.034		min. 20		5
Tomatoes	USA	CS 12	foliar	0.034				5
Triticale	USA	CS 12	foliar	0.034				30 (harvest) 7 (grazing, forage)
Triticale	USA	CS 12	foliar, aerial	0.034		min. 20		30 (harvest) 7 (grazing, forage)

Crop	Country	Application details						
		Form	Type	kg ai/ha	kg ai/hL	L/ha	No.	Pre harvest interval (PHI) in days
Vigna species (legume vegetables and pulses)	USA	CS 12	foliar	0.034				7 (legume vegetable) 21 (pulses)
Vigna species (legume vegetables and pulses)	USA	CS 12	foliar, aerial	0.034		min. 20		7 (legume vegetable) 21 (pulses)
Walnuts	France	CS 10	foliar		0.001		1	7
Walnuts	USA	CS 12	foliar	0.045				14
Walnuts	USA	CS 12	foliar, aerial	0.045		min. 50		14
Wheat	Australia	EC 25	foliar	0.010				14
Wheat	Italy	CS 10	foliar	0.015	0.003			30
Wheat	Portugal	CS 10	foliar	0.008				28
Wheat	USA	CS 12	foliar, aerial	0.034		min. 20		30 (harvest) 7 (grazing, forage)
Wheat	USA	CS 12	foliar	0.034				30 (harvest) 7 (grazing, forage)
Witloof chicory	France	CS 10	foliar	0.013			2	14

RESIDUES RESULTING FROM SUPERVISED TRIALS ON CROPS

Trials were generally well documented with laboratory and field reports. Laboratory reports included method validation with procedural recoveries from spiking at residues levels similar to those occurring in samples from supervised trials. Dates of analyses or duration of residue sample storage were also provided. Although trials included control plots, no control data are recorded in the tables except where residues in control samples exceeded the LOQ. Residue data are recorded unadjusted for recovery.

In trials where duplicate field samples from an unreplicated plot were taken at each sampling time and analysed separately each figure is presented individually. When samples were analysed more than once all results are listed and the mean is presented in brackets.

When residues were not detected they are shown as below the LOQ (e.g., < 0.01 mg/kg). Residues, application rates and spray concentrations have generally been rounded to two significant figures or, for residues near the LOQ, to one significant figure. Residue values from trials conducted according to maximum GAP have been used for the estimation of maximum residue levels. Those results included in the evaluation are double underlined.

Conditions of the supervised residue trials were generally well reported in detailed field reports. Most trial designs used non-replicated plots. Most field reports provided data on the sprayers used, plot size, field sample size and sampling date.

Table 44 Lambda-cyhalothrin - supervised residue trials

Commodity	Indoor/Outdoor	Treatment	Countries	Table
Mandarins	outdoor	foliar	Spain	Table 45
Oranges	outdoor	foliar	Italy, Spain	Table 46
Apples	outdoor	foliar	France, Italy	Table 47
Pears	outdoor	foliar	USA	Table 48
Cherries	outdoor	foliar	USA	Table 49
Peaches	outdoor	foliar	France, Italy, USA	Table 50

Commodity	Indoor/Outdoor	Treatment	Countries	Table
Plums	outdoor	foliar	USA	Table 51
Currants	outdoor	foliar	France, Italy, Spain, United Kingdom	Table 52
Gooseberries	outdoor	foliar	Germany	Table 53
Grapes	outdoor	foliar	France, Greece, Italy, Spain	Table 54
Raspberries	outdoor	foliar	France, United Kingdom	Table 55
Strawberries	outdoor	foliar	France, Italy, Spain, United Kingdom	Table 56
Olives	outdoor	foliar	Italy, Spain	Table 57
Mango	outdoor	foliar	Thailand	Table 58
Onions	outdoor	foliar	USA	Table 59
Broccoli	outdoor	foliar	Spain, USA	Table 60
Cauliflower	outdoor	foliar	France, Italy, Spain	Table 61
Cabbage	outdoor	foliar	France, Spain, USA	Table 62
Spinach	outdoor	foliar	France	Table 63
Cucumbers	protected	foliar	Italy, Spain	Table 64
Courgettes	outdoor	foliar	Italy, Spain	Table 65
Melons	outdoor	foliar	France	Table 66
Melons	protected	foliar	France	Table 67
Peppers (bell)	outdoor	foliar	USA	Table 68
Tomatoes	outdoor	foliar	USA	Table 69
Sweet corn	outdoor	foliar	USA	Table 70
Beans (green)	outdoor	foliar	France, Spain, USA	Table 71
Peas (green)	outdoor	foliar	USA	Table 72
Soya beans (immature)	outdoor	foliar	Thailand	Table 73
Beans (pulses)	outdoor	foliar	USA	Table 74
Peas (pulses)	outdoor	foliar	USA	Table 75
Soya beans	outdoor	foliar (ground)	USA, Mexico	Table 76
Soya beans	outdoor	foliar (aerial)	USA	Table 77
Carrots	outdoor	foliar	France, Italy, Spain	Table 78
Potatoes	outdoor	foliar	France, Italy, Spain	Table 79
Asparagus (green)	outdoor	foliar	Thailand	Table 80
Leek	outdoor	foliar	France, United Kingdom	Table 81
Barley grain	outdoor	foliar	France, Germany, Italy, Spain	Table 82
Maize grain	outdoor	foliar	USA	Table 83
Oats grain	outdoor	foliar	Germany	Table 84
Rye grain	outdoor	foliar	Germany	Table 85
Triticale grain	outdoor	foliar	Germany	Table 86
Wheat grain	outdoor	foliar	Germany, USA	Table 87
Rice grain	outdoor	foliar	USA	Table 88
Sorghum grain	outdoor	foliar (ground)	USA	Table 89
Sorghum grain	outdoor	foliar	USA	Table 90

Commodity	Indoor/Outdoor	Treatment	Countries	Table
		(aerial)		
Sorghum grain	outdoor	furrow irrigation	USA	Table 91
Sugarcane	outdoor	foliar	USA	Table 92
Almonds	outdoor	foliar	USA	Table 93
Pecan nuts	outdoor	foliar	USA	Table 94
Oilseed rape seeds	outdoor	foliar	USA	Table 95
Sunflower seeds	outdoor	foliar (ground)	USA	Table 96
Sunflower seeds	outdoor	foliar (aerial)	USA	Table 97
Cottonseeds	outdoor	foliar (ground)	USA	Table 98
Cottonseeds	outdoor	foliar (aerial)	USA	Table 99
Peanuts	outdoor	foliar (ground)	USA	Table 100
Peanuts	outdoor	foliar (aerial)	USA	Table 101
Peanut hay	outdoor	foliar	USA	Table 102
Soya bean fodder	outdoor	foliar (ground)	Mexico	Table 103
Wheat forage	outdoor	foliar	Germany, USA	Table 104
Barley forage	outdoor	foliar	France, Germany, Italy, Spain	Table 105
Oats forage	outdoor	foliar	Germany	Table 106
Rye forage	outdoor	foliar	Germany	Table 107
Triticale forage	outdoor	foliar	Germany	Table 108
Maize and sweet corn forage, silage and fodder	outdoor	foliar	USA	Table 109
Sorghum forage and fodder	outdoor	foliar	USA	Table 110
Wheat straw	outdoor	foliar	Germany, USA	Table 111
Barley straw	outdoor	foliar	France, Germany, Italy, Spain	Table 112
Oats straw	outdoor	foliar	Germany	Table 113
Rye straw	outdoor	foliar	Germany	Table 114
Triticale straw	outdoor	foliar	Germany	Table 115
Rice straw	outdoor	foliar	USA	Table 116
Almond hulls	outdoor	foliar	USA	Table 117
Sunflower forage	outdoor	foliar (ground)	USA	Table 118
Sunflower forage	outdoor	foliar (aerial)	USA	Table 119
Peanut hulls	outdoor	foliar (ground)	USA	Table 120

Commodity	Indoor/Outdoor	Treatment	Countries	Table
Peanut hulls	outdoor	foliar (aerial)	USA	Table 121

Table 45 Lambda-cyhalothrin residues in mandarins following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report ,Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain,	EC 5	2	0.028	0.002	whole Fruit	0.11	0[a]	AF/4924/ZE,
Rotgla			0.028			0.15	0	ES40-99-S035
						0.15	3	
1999						0.11[b]	7	Brereton, 2000
(Orogrande)					pulp	< 0.01	7	
					peel	0.45	7	
Spain,	EC 5	2	0.016	0.002	whole Fruit	0.1	0[a]	AF/4924/ZE,
Silla			0.016			0.2	0	ES40-99-S135
						0.23	3	
1999						0.16[b]	7	Brereton, 2000
(Clemenpons)					pulp	< 0.01	7	
					peel	0.71	7	
Spain,	EC 5	2	0.032	0.002	whole Fruit	0.03	0[a]	AF/4924/ZE,
Puebla del Rio			0.032			0.07	0	ES40-99-S235
						0.07	3	
1999						0.07	7[b]	Brereton, 2000
(Marisol)					pulp	< 0.01	7	
					peel	0.24	7	
Spain,	EC 5	2	0.036	0.002	whole Fruit	0.03	0[a]	AF/4924/ZE,
Benacazòn			0.036			0.03	0	ES40-99-S335
						0.02	3	
1999						0.02	7[b]	Brereton, 2000
(Clemenules)					pulp	< 0.01	7	
					peel	0.08	7	
Spain,	EC 5	2	0.037	0.002	whole fruit	0.06[b]	7	AF/5107/ZE,
Coria del Rio			0.042		pulp	< 0.01	7	AF/5107/ZE/1
					peel	0.22	7	
2000								Goodband, 2001
(Okitsu)								
Spain,	EC 5	2	0.036	0.002	whole fruit	0.05[b]	7	AF/5107/ZE,
Tocina			0.036		pulp	< 0.01	7	AF/5107/ZE/2
					peel	0.16	7	
2000								Goodband, 2001
(Clemenville)								
Spain,	EC 5	2	0.034	0.002	whole fruit	0.06[b]	7	AF/5107/ZE,
Palma del Rio			0.034		pulp	< 0.01	7	AF/5107/ZE/3
					peel	0.22	7	
2000								Goodband, 2001
(Clementina Nova)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report ,Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain,	EC 5	2	0.038	0.002	whole fruit	0.03[b]	7	AF/5107/ZE,
El Rocio			0.036		pulp	< 0.01	7	AF/5107/ZE/4
					peel	0.13	7	
2000								Goodband, 2001
(Clemenules)								
Spain, Brenes	EC 5	2	0.037	0.002	whole fruit	0.03	0[a]	AF/5107/ZE,
			0.036			0.04	0	AF/5107/ZE/5
2000						0.08	3	
(Clemenules)						0.04[b]	7	Goodband, 2001
					pulp	< 0.01	7	
					peel	0.17	7	
Spain,	EC 5	2	0.038	0.002	whole fruit	0.03	0[a]	AF/5107/ZE,
El Viso del Alcor			0.036			0.05	0	AF/5107/ZE/6
						0.08	3	
2000						0.05[b]	7	Goodband, 2001
(Clemenules)					pulp	< 0.01	7	
					peel	0.15	7	

[a] before last treatment

[b] calculated

Table 46 Lambda-cyhalothrin residues in oranges following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report, Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain,	EC 5	2	0.04	0.002	pulp	< 0.01	7	RJ2017B,
Silla					peel	0.09	7	ES10-95-SE003
1995								Jones, 1996
(Valencia LTAE)								
Spain,	EC 5	2	0.04	0.002	pulp	< 0.01	7	RJ2017B,
Bollullos					peel	0.07	7	ES10-95-SE103
1995								Jones, 1996
(Navelino)								
Italy,	EC 5	2	0.03	0.002	whole fruit	0.04	7	RJ2001B,
Via Vallaneto			0.03		pulp	< 0.01	7	IT10-94-E392-1
					peel	0.09	7	
1994								Tummon, 1995
(Blondo)								
Italy,	EC 5	2	0.04	0.004	whole fruit	0.04	7	RJ2001B,
Via Vallaneto			0.04		pulp	0.01	7	IT10-94-E392-2
					peel	0.23	7	
1994								Tummon, 1995
(Bionda)								
Italy,	EC 5	2	0.03	0.002	whole fruit	0.04	7	RJ2001B,
Contrada Galliano			0.03		pulp	0.01	7	IT10-94-E393-1
					peel	0.07	7	
1994								Tummon, 1995
(Navelina)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report, Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Italy, Contrada Galliano	EC 5	2	0.04 0.04	0.004	whole fruit pulp peel	0.04 0.01 0.1	7 7 7	RJ2001B, IT10-94-E393-2
1994 (Navelina)								Tummon, 1995
Spain, Brenes	EC 5	2	0.036 0.037	0.002	whole fruit	0.02 0.05 0.03	0[a] 0 3	AF/4881/ZE, ES50-99-S036
1999 (Navelia)						0.04[b]	8	Brereton, 2000a
					pulp	< 0.01	8	
					peel	0.11	8	
					whole fruit	0.02	8	
					pomace, wet	0.06	8	
					pomace, dry	0.17	8	
					orange juice	< 0.01	8	
					marmalade	< 0.01	8	
Spain, La Riconada	EC 5	2	0.039 0.037	0.002	whole fruit	0.03 0.05 0.04	0[a] 0 3	AF/4881/ZE, ES50-99-S136
1999 (Navelina)						0.05[b]	8	Brereton, 2000a
					pulp	< 0.01	8	
					peel	0.14	8	
					whole fruit	0.06	8	
					pomace, wet	0.11	8	
					pomace, dry	0.24	8	
					orange juice	< 0.01	8	
					marmalade	0.02	8	
Spain, Benacazòn	EC 5	2	0.039 0.038	0.002	whole fruit	0.05 0.05 0.05	0[a] 0 3	AF/4881/ZE, ES50-99-S236
1999 (Navelate)						0.04[b]	7	Brereton, 2000a
					pulp	< 0.01	7	
					peel	0.12	7	

a before last treatment

b calculated

Table 47 Lambda-cyhalothrin residues in apples following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South), Lizac	CS 10	2	0.022	0.0025	fruit	0.02 0.04 0.05	0[a] 0 3	RJ3415B, AF/6469/SY/1
2002 (Braeburn)						0.04 0.03	7 14	Ely, 2003
Italy, Malalbergo	CS 10	2	0.025	0.0025	fruit	0.01 0.02 0.02	0[a] 0 3	RJ3415B, AF/6469/SY/2
2002 (Fuji)						0.02 0.02	7 14	Ely, 2003

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Italy,	CS 10	2	0.029	0.002	fruit	< 0.01, < 0.01 (< 0.01)	0[a]	AF/7925/SY,
Malalbergo			0.026	0.002				AF/7925/SY1
						0.02, 0.02 (0.02)	0	
2004						0.02, 0.02 (0.02)	3	Stevenson, 2005
(Imperatore Dallago)						0.02, 0.02 (<u>0.02</u>)	7	
						0.01, 0.02 (0.02)	14	
						< 0.01, < 0.01 (< 0.01)	21	
Italy,	CS 10	2	0.027	0.002	fruit	< 0.01, 0.01 (0.01)	0[a]	AF/7925/SY,
Malalbergo			0.026	0.002		0.01, 0.03 (0.02)	0	AF/7925/SY1
						0.04, 0.04 (0.04)	3	
2004						0.03, 0.02 (0.03)	7	Stevenson, 2005
(Fuji)						0.02, 0.02 (0.02)	14	
						0.02, 0.03 (<u>0.03</u>)	21	
Italy,	CS 10	2	0.028	0.002	fruit	0.01	0[a]	AF/8670/SY,
Tintoria			0.029	0.002		0.02	0	AF/8670/SY/1
						0.03	3	
2005						0.02	7	North, 2006
(Golden Delicious)						0.03	14	
						0.01	21	
Italy,	CS 10	2	0.028	0.002	fruit	< 0.01	0[a]	AF/8670/SY,
Malalbergo			0.03	0.002		0.04	0	AF/8670/SY/1
						0.02	3	
2005						0.04	7	North, 2006
(Fuji)						0.02	14	
						0.01	21	
France (North),	CS 10	1	0.02	0.0018	fruit	0.01	7	AF/5271/ZE,
La Chapelle Angillou					fruit, washed	< 0.01	7	AF/5271/ZE/1
					fruit, peeled	< 0.01	7	
2000					peel	0.06	7	Goodband, 2001d
(Braeburn)					wet pomace	< 0.01	7	
					dry pomace	< 0.01	7	
					juice	< 0.01	7	
					puree	< 0.01	7	
France (North),	CS 10	1	0.02	0.0018	fruit	< 0.01	7	AF/5271/ZE,
St. Hilaire St. Mesmin					fruit, washed	< 0.01	7	AF/5271/ZE/2
					fruit, peeled	< 0.01	7	
2000					peel	0.05	7	Goodband, 2001d
(Golden)					wet pomace	< 0.01	7	
					dry pomace	< 0.01	7	
					juice	< 0.01	7	
					puree	< 0.01	7	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	CS 12	5	0.045	0.001	l.-cyhalothrin:			RR99-010B,
Granger (WA)					fruit	0.08, 0.09 (0.09)	21	15-WA-97-712
					wet pomace	0.68, 0.69 (0.69)	21	
1997					juice	< 0.01, < 0.01 (< 0.01)	21	Spillner, 1999b
(Rome)					R157836:			
					fruit	< 0.01, < 0.01 (< 0.01)	21	
					wet pomace	0.06, 0.06 (0.06)	21	
					juice	< 0.001, < 0.001 (< 0.001)	21	

a before last treatment

Table 48 Lambda-cyhalothrin residues in pears following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	CS 25	5	0.045	0.008	fruit			RR98-072B,
Visalia (CA)					l.-cyhalothrin:	0.05	20	02-CA-97-741
						0.06	20	
1997					R157836:	< 0.01	20	Spillner, 1999
(Monterry)						< 0.01	20	
USA,	CS 25	5	0.045	0.008	fruit			RR98-072B,
White Salmon (WA)					l.-cyhalothrin:	0.08	20	15-WA-97-742
						0.09, 0.1 (0.1)	20	
(Bartlett)						< 0.01		Spillner, 1999
					R157836:	< 0.01, < 0.01 (< 0.01)	20	
							20	
USA,	CS 25	5	0.045	0.009	fruit			RR98-072B,
Buena (WA)					l.-cyhalothrin:	0.09	20	15-WA-97-743
						0.09	20	
(Bartlett)					R157836:	< 0.01	20	Spillner, 1999
						< 0.01	20	
USA,	CS 25	5	0.045	0.004	fruit			RR98-072B,
Fairfield (CA)			0.045	0.002	l.-cyhalothrin:	0.04	20	17-CA-97-744
			0.045	0.002		0.05	20	
(Bartlett)			0.045	0.002	R157836:	< 0.01	20	Spillner, 1999
			0.045	0.002		< 0.01	20	
USA,	CS 25	5	0.045	0.003	fruit			RR98-072B,
Hood River (OR)					l.-cyhalothrin:	0.09	21	16-OR-97-745
						0.09, 0.1 (0.1)	21	
(Bosc)					R157836:	< 0.01	21	Spillner, 1999
						< 0.01, < 0.01 (< 0.01)	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	CS 25	5	0.045	0.008	fruit			RR98-072B,
Sodus Township (NY)					l.-cyhalothrin:	0.05	20	57-NY-97-746
					R157836:	< 0.01	20	
(Bartlett)								Spillner, 1999
USA,	CS 25	5	0.045	0.002	fruit			RR98-072B,
Sodus Township (NY)					l.-cyhalothrin:	0.07	20	57-NY-97-746
					R157836:	< 0.01	20	
(Bartlett)								Spillner, 1999

R157836 (epimer of lambda-cyhalothrin)

Table 49 Lambda-cyhalothrin residues in cherries following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	CS 10	5	0.045	0.007	whole fruit			RR98-060B,
Hart (MI)					l.-cyhalothrin:	0.07	13	89-MI-97-761
						0.04	13	
1997					R157836:	< 0.01	13	Spillner, 1999a
(Ulster)						< 0.01	13	
USA,	CS 10	5	0.045	0.007	whole fruit			RR98-060B,
Coppersville (MI)					l.-cyhalothrin:	0.07	13	89-MI-97-762
						0.05	13	
1997					R157836:	< 0.01	13	Spillner, 1999a
(Heidelfingen)						< 0.01	13	
USA,	CS 10	5	0.045	0.007	whole fruit			RR98-060B,
Hughson (CA)					l.-cyhalothrin:	0.11	14	17-CA-97-763
						0.11	14	
1997					R157836:	0.01	14	Spillner, 1999a
(Bing)						0.01	14	
USA,	CS 10	5	0.045	0.007	whole fruit			RR98-060B,
Yakima (WA)					l.-cyhalothrin:	0.08	14	15-WA-97-764
						0.09	14	
1997					R157836:	< 0.01	14	Spillner, 1999a
(Bing)						< 0.01	14	
USA,	CS 10	5	0.045	0.002	whole fruit			RR98-060B,
Hart (MI)					l.-cyhalothrin:	0.16	13	89-MI-97-765
						0.16	13	
1997					R157836:	0.01	13	Spillner, 1999a
(Gold)						0.01	13	
USA,	CS 10	5	0.045	0.002	whole fruit			RR98-060B,
Ada (MI)					l.-cyhalothrin:	0.14	13	89-MI-97-766
						0.12	13	
1997					R157836:	0.01	13	Spillner, 1999a
(Sam´s)						< 0.01	13	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	/Trial No., Author)
USA,	CS 10	5	0.045	0.002	whole fruit			RR98-060B,
Fairfield (CA)					l.-cyhalothrin:	0.05	13	17-CA-97-767
						0.05	13	
1997					R157836:	< 0.01	13	Spillner, 1999a
(Bing)						< 0.01	13	
USA,	CS 10	5	0.045	0.008	whole fruit			RR98-060B,
Parkdale (OR)					l.-cyhalothrin:	0.12	13	15-OR-97-769
						0.18	13	
1997					R157836:	0.01	13	Spillner, 1999a
(Lambert)						0.02	13	
USA,	CS 10	5	0.045	0.008	whole fruit			RR98-060B,
Salem (OR)					l.-cyhalothrin:	0.15	13	16-OR-97-770
					R157836:	0.02	13	
1997								Spillner, 1999a
(Van)								
USA,	CS 10	5	0.045	0.002	whole fruit			RR98-060B,
Salem (OR)					l.-cyhalothrin:	0.17, 0.18 (0.18)	13	16-OR-97-770
					R157836:	0.02, 0.02 (0.02)	13	
1997								Spillner, 1999a
(Van)								

R157836 (epimer of lambda-cyhalothrin)

Table 50 Lambda-cyhalothrin residues in peaches following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (North),	CS 10	2	0.024	0.002	whole fruit	0.01	0[a]	AF/5836/SY,
St. Hilaire St. Mesmin			0.027	0.002		0.04	0	AF/5836/SY/1
						0.02	3	
2001						0.02	7	Goodband, 2002
(Babiole)						< 0.01	14	
France (North),	CS 10	2	0.024	0.002	whole fruit	0.02	0[a]	RJ3392B,
Linieres de Touraine						0.04	0	AF/6486/SY/1
						0.02	3	
2002						0.02	7	Ryan, 2003
(Dixy Red)						< 0.01	14	
France (North),	CS 10	2	0.026	0.002	whole fruit	0.02	0[a]	AF/8627/SY,
St. Hilaire St. Mesmin						0.06	0	AF/8627/SY
						0.03	3	
2005						0.03	7	North, 2005
(Red Robin)						0.01	14	
						0.01	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South),	CS 10	2	0.028	0.003	whole fruit	0.01	0[a]	AF/5068/ZE,
Meauzac						0.03	0	AF/5068/ZE/1
						0.02	3	
2000						0.01	7	Anthony, 2001
(Tenchesse)						0.02	14	
					whole fruit	0.02	7	
					fruits, washed	0.02	7	
					washing water	< 0.01	7	
					jam	< 0.01	7	
					canned peaches	< 0.01	7	
France (South),	CS 10	2	0.029	0.003	whole fruit	0.07	0[a]	AF/5068/ZE,
Goulard						0.12	0	AF/5068/ZE/1
						0.05	3	
2000						0.05	7	Anthony, 2001
(Meril Sundance)						0.05	14	
					whole fruit	0.04	7	
					fruits, washed	0.06	7	
					washing water	< 0.01	7	
					jam	< 0.01	7	
					canned peaches	< 0.01	7	
Italy,	EC 50	2	0.03	0.003	whole fruit	0.03	7	17704,
Buttapietra								IT20-98-E334
1998								Old, 1999
(Merrill Angel)								
France (South),	CS 10	2	0.03	0.003	whole fruit	0.02	0[a]	RJ3489B,
St. Sardos						0.05	0	AF/6487/SY/1
						0.04	3	
2002						0.03	7	Ryan, 2004
(Bienvenue)						0.02	14	
France (South),	CS 10	2	0.024	0.003	whole fruit	0.01	0[a]	RJ3489B,
Meauzac						0.02	0	AF/6487/SY/2
						0.04	3	
2002						0.03	7	Ryan, 2004
(Royal Glori)						0.02	14	
France (South),	CS 10	2	0.026	0.003	whole fruit	0.01	0[a]	RJ3489B,
Lizac						0.04	0	AF/6487/SY/3
						0.01	7	
2002						< 0.01	14	Ryan, 2004
(Synphonie)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South), St. Sardos 2002 (Bienvenue)	CS 10	2	0.06	0.006	whole fruit	0.09	7	RJ3489B, AF/6487/SY/1 Ryan, 2004
					washed fruit	0.02	7	
					unwashed peach	0.07	7	
					wet pomace	0.37	7	
					dry pomace	1.4	7	
					raw juice	0.01	7	
					juice	< 0.01	7	
					peels (canned)	0.67	7	
					peeled peaches	< 0.01	7	
					canned fruit	< 0.01	7	
					peels (jam)	0.2	7	
					crushed peaches	< 0.01	7	
					peach jam	< 0.01	7	
					waste (puree)	0.46	7	
					sieved peaches	0.02	7	
					peach puree	0.02	7	
France (South), Meauzac 2002 (Royal Glori)	CS 10	2	0.048	0.006	whole fruit	0.03	7	RJ3489B, AF/6487/SY/2 Ryan, 2004
					washed fruit	0.01	7	
					unwashed peach	0.03	7	
					wet pomace	0.08	7	
					dry pomace	0.51	7	
					raw juice	0.02	7	
					juice	0.01	7	
					peels (canned)	0.1	7	
					peeled peaches	< 0.01	7	
					canned fruit	< 0.01	7	
					peels (jam)	0.16	7	
					crushed peaches	< 0.01	7	
					peach jam	< 0.01	7	
					waste (puree)	0.08	7	
					sieved peaches	0.01	7	
					peach puree	< 0.01	7	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	CS 25	4	0.045	0.007	whole fruit			RR98-062B,
Hereford (PA)					l.-cyhalothrin:	0.14	7	70-PA-97-721
						0.09	7	
1997						0.09	10	Spillner, 1998
(Glohaven)						0.03	10	
						0.06	14	
						0.08	14	
						0.06	17	
						0.07	17	
						0.06	20	
						0.05	20	
					R157836:	< 0.01	7	
						< 0.01	10	
						< 0.01	10	
						< 0.01	14	
						< 0.01	14	
						< 0.01	17	
						< 0.01	17	
						< 0.01	20	
						< 0.01	20	
USA,	CS 25	4	0.045	0.008	whole fruit			RR98-062B,
Winterville (GA)					l.-cyhalothrin:	0.11	13	88-GA-97-723
						0.07	13	
1997					R157836:	< 0.01	13	Spillner, 1998
(Winblo)						< 0.01	13	
USA,	CS 25	4	0.045	0.008	whole fruit			RR98-062B,
Visalia (CA)					l.-cyhalothrin:	0.13	14	02-CA-97-724
						0.1	14	
1997					R157836:	< 0.01	14	Spillner, 1998
(O´Henry)						< 0.01	14	
USA,	CS 25	4	0.045	0.007	whole fruit			RR98-062B,
Madera (CA)					l.-cyhalothrin:	0.04	14	18-CA-97-725
						0.05	14	
1997					R157836:	< 0.01	14	Spillner, 1998
(Suncrest)						< 0.01	14	
USA,	CS 25	4	0.045	0.002	whole fruit			RR98-062B,
Orefield (PA)					l.-cyhalothrin:	0.11	14	70-PA-97-726
						0.11	14	
1997					R157836:	< 0.01	14	Spillner, 1998
(Red Haven)						< 0.01	14	
USA,	CS 25	4	0.045	0.002	whole fruit			RR98-062B,
Chula (GA)					l.-cyhalothrin:	0.18	14	88-GA-97-727
						0.2	14	
1997					R157836:	0.02	14	Spillner, 1998
(June Gold)						0.02	14	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	CS 25	4	0.045	0.002	whole fruit			RR98-062B,
York (SC)					l.-cyhalothrin:	0.1	13	47-SC-97-728
						0.27, 0.38 (0.33)	13	
1997					R157836:	< 0.01	13	Spillner, 1998
(Sunhaven)						0.02, 0.03 (0.03)	13	
USA,	CS 25	4	0.045	0.002	whole fruit			RR98-062B,
Marysville (CA)					l.-cyhalothrin:	0.08	14	17-CA-97-729
						0.14	14	
1997					R157836:	< 0.01	14	Spillner, 1998
(Loadel)						< 0.01	14	
USA,	CS 25	4	0.045	0.007	whole fruit			RR98-062B,
Conklin (MI)					l.-cyhalothrin:	0.09	14	89-MI-97-730
					R157836:	< 0.01	14	
1997								Spillner, 1998
(Red Haven)								
USA,	CS 25	4	0.045	0.002	whole fruit			RR98-062B,
Conklin (MI)					l.-cyhalothrin:	0.09	14	89-MI-97-730
					R157836:	< 0.01	14	
1997								Spillner, 1998
(Red Haven)								
USA,	CS 25	4	0.045	0.007	whole fruit			RR98-062B,
Wharton (TX)					l.-cyhalothrin:	0.06	14	25-TX-97-731
					R157836:	< 0.01	14	
1997								Spillner, 1998
(June Gold)								
USA,	CS 25	4	0.045	0.002	whole fruit			RR98-062B,
Wharton (TX)					l.-cyhalothrin:	0.04	14	25-TX-97-731
					R157836:	< 0.01	14	
1997								Spillner, 1998
(June Gold)								
USA,	CS 25	4	0.045	0.002	whole fruit			RR98-062B,
Higley (AZ)					l.-cyhalothrin:	0.01	13	14-AZ-97-733
						0.02	13	
1997					R157836:	< 0.01	13	Spillner, 1998
(Desert Gold)						< 0.01	13	
USA,	CS 25	4	0.045	0.007	whole fruit			RR98-062B,
Taylorsville (NC)					l.-cyhalothrin:	0.14	13	47-NC-97-734
						0.09	13	
1997					R157836:	0.01	13	Spillner, 1998
(Georgia Bells)						< 0.01	13	

a before last treatment

R157836 (epimer of lambda-cyhalothrin)

Table 51 Lambda-cyhalothrin residues in plums following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	CS 25	5	0.045	0.008	whole fruit			RR98-053B,
Mears (MI)					l.-cyhalothrin:	0.05	13	89-MI-97-751
						0.07	13	
1997					R157836:	< 0.01	13	Spillner, 1998b
(Stanley)						< 0.01	13	
USA,	CS 25	5	0.045	0.008	whole fruit			RR98-053B,
Visalia (CA)					l.-cyhalothrin:	0.02	13	02-CA-97-752
						0.02	13	
1997					R157836:	< 0.01	13	Spillner, 1998b
(Santa Rosa)						< 0.01	13	
USA,	CS 25	5	0.045	0.008	whole fruit			RR98-053B,
Sultana (CA)					l.-cyhalothrin:	0.01	13	18-CA-97-753
						0.01	13	
1997					R157836:	< 0.01	13	Spillner, 1998b
(Nubiana)						< 0.01	13	
USA,	CS 25	5	0.045	0.002	whole fruit			RR98-053B,
Grand Rapids (MI)					l.-cyhalothrin:	0.09	13	89-MI-97-754
						0.1	13	
1997					R157836:	< 0.01	13	Spillner, 1998b
(Stanley)						0.01	13	
USA,	CS 25	5	0.045	0.002	whole fruit			RR98-053B,
Orosi (CA)					l.-cyhalothrin:	< 0.01	13	18-CA-97-755
						< 0.01	13	
1997					R157836:	< 0.01	13	Spillner, 1998b
(Friar)						< 0.01	13	
USA,	CS 25	5	0.045	0.002	whole fruit			RR98-053B,
Chico (CA)					l.-cyhalothrin:	0.03	14	17-CA-97-756
						0.03	14	
1997					R157836:	< 0.01	14	Spillner, 1998b
(French)						< 0.01	14	
USA,	CS 25	5	0.045	0.002	whole fruit			RR98-061B,
Chico (CA)					l.-cyhalothrin:	0.04	14	17-CA-97-756
						0.06	14	(replicate)
1997					R157836:	< 0.01	14	
(French)						< 0.01	14	Spillner, 1998
USA,	CS 25	5	0.045	0.008	whole fruit			RR98-053B,
Forest Grove (OR)					l.-cyhalothrin:	0.02	14	16-OR-97-757
					R157836:	< 0.01	14	
1997								Spillner, 1998b
Italian)								
USA,	CS 25	5	0.045	0.002	whole fruit			RR98-053B,
Forest Grove (OR)					l.-cyhalothrin:	0.02	14	16-OR-97-757
					R157836:	< 0.01	14	
1997								Spillner, 1998b
(Italian)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	CS 25	5	0.045	0.008	whole fruit			RR98-053B,
Fairfield (CA)					l.-cyhalothrin:	0.03	14	17-CA-97-758
						0.04	14	
1997					R157836:	< 0.01	14	Spillner, 1998b
(French Prune)						< 0.01	14	
USA,	CS 25	5	0.045	0.008	whole fruit			RR98-053B,
Toppenish (WA)					l.-cyhalothrin:	0.01	13	15-WA-97-759
1997					R157836:	< 0.01	13	
(Friar)								Spillner, 1998b
USA,	CS 25	5	0.045	0.002	whole fruit			RR98-053B,
Toppenish (WA)					l.-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	13	15-WA-97-759
1997 (Friar)					R157836:	< 0.01, < 0.01 (< 0.01)	13	Spillner, 1998b
France (South),	CS 10	2	0.025	0.0025	whole fruit	< 0.01	0[a]	AF/5837/SY,
Montesquieu						< 0.01	0	AF/5837/SY/1
						< 0.01	3	
2001						< 0.01	7	Goodband, 2002g
(Stanley)						< 0.01	14	
					whole fruit	< 0.01	7	
					washed fruit	< 0.01	7	
					wet pomace	< 0.01	7	
					juice	< 0.01	7	
					canned fruit	< 0.01	7	
					jam	< 0.01	7	
France (South),	CS 10	2	0.025	0.0025	whole fruit	< 0.01	0[a]	AF/5837/SY,
La Francaise						0.01	0	AF/5837/SY/2
						0.02	3	
2001						0.01	7	Goodband, 2002g
(Reine Claude Bavais)						0.01	14	
					whole fruit	0.02	7	
					washed fruit	< 0.01	7	
					wet pomace	0.01	7	
					juice	< 0.01	7	
					canned fruit	< 0.01	7	
					jam	0.02	7	

a before last treatment

R157836 = epimer of lambda-cyhalothrin

Table 52 Lambda-cyhalothrin residues in currants following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (North), Traenheim	CS 10	2	0.026	0.002	berries	0.01	0[a]	AF/8747/SY,
						0.03	0	AF/8747/SY/3
						0.03	3	
2005						0.03	6	North, 2006a
(Heinemans Spaetlese)						0.02	14	
						0.02	20	
France (North), Omissy	CS 10	2	0.026	0.002	berries	0.02	0[a]	AF/8747/SY,
						0.08	0	AF/8747/SY/4
						0.11	3	
2005						0.02	7	North, 2006a
(not reported)						0.02	14	
						0.02	21	
United Kingdom, Bridge	CS 10	2	0.022	0.002	berries	0.03	0[a]	AF/5839/SY,
						0.1	0	AF/5839/SY/1
						0.05	3	
2000						0.04	7	Goodband, 2001a
(Ben Tiren)						< 0.01	14	
United Kingdom, Upper Hill	CS 10	2	0.022	0.002	berries	0.09	0[a]	AF/5839/SY,
						0.15	0	AF/5839/SY/2
						0.15	3	
2000						0.12	7	Goodband, 2001a
(Ben Alder)						0.08	14	
France (North), Ige	CS 10	2	0.011	0.0008	berries	0.02	0[a]	RJ3419B,
						0.08	0	AF/6477/SY/1
						0.04	3	
2002						0.04	7	Ryan, 2004a
(Royal de Naple)						0.03	14	
						0.02	21	
France (North), Ige	CS 10	2	0.026	0.002	berries	0.09	0[a]	RJ3419B,
						0.21	0	AF/6477/SY/1
						0.14	3	
2002						0.09	7	Ryan, 2004a
(Royal de Naple)						0.07	14	
						0.06	21	
					berries	0.1	7	
					washed berries	0.08	7	
					jam	0.09	7	
					canned fruit	0.06	7	
					wet pomace	0.31	7	
					raw juice	0.03	7	
					juice	0.03	7	
					pomace	0.14	7	
					jelly	0.04	7	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (North),	CS 10	2	0.009	0.0008	berries	0.03	0[a]	RJ3419B,
Beaufort-en-vallee						0.06	0	AF/6477/SY/2
						0.06	3	
2002						0.05	7	Ryan, 2004a
(Blackdown)						0.04	14	
						0.04	21	
France (North),	CS 10	2	0.023	0.002	berries	0.06	0[a]	RJ3419B,
Beaufort-en-vallee						0.16	0	AF/6477/SY/2
						0.15	3	
2002						0.08	7	Ryan, 2004a
(Blackdown)						0.07	14	
						0.07	21	
					berries	0.1	7	
					washed berries	0.1	7	
					jam	0.07	7	
					canned fruit	0.06	7	
					wet pomace	0.24	7	
					raw juice	0.05	7	
					juice	0.04	7	
					pomace	0.17	7	
					jelly	0.01	7	
Spain,	CS 10	2	0.026	0.002	berries	0.02	0[a]	AF/8748/SY,
Valdes						0.07	0	AF/8748/SY/3
						0.03	3	
2005						0.03	7	North, 2006b
(Red Junifer)						0.02	14	
						0.01	21	
Spain,	CS 10	2	0.026	0.002	berries	0.04	0[a]	AF/8748/SY,
Villaviciosa						0.06	0	AF/8748/SY/4
						0.07	3	
2005						0.04	7	North, 2006b
(Thevaf black)						0.04	14	
						0.03	21	
Italy,	CS 10	2	0.027	0.002	berries	< 0.01	0[a]	AF/8748/SY,
Faida						0.03	0	AF/8748/SY/5
						< 0.01	3	
2005						< 0.01	7	North, 2006b
(Rovada)						< 0.01	15	
						< 0.01	21	
Italy,	CS 10	2	0.026	0.002	berries	< 0.01	0[a]	AF/8748/SY,
Faida						0.02	0	AF/8748/SY/6
						0.02	3	
2005						< 0.01	7	North, 2006b
(Rovada)						< 0.01	15	
						< 0.01	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South),	CS 10	2	0.025	0.002	berries	0.05	0[a]	AF/5840/SY,
Ornacieux			0.026	0.002		0.1	0	AF/5840/SY/1
						0.09	3	
2001						0.05	7	Goodband, 2002b
(Blackdon)						0.03	14	
France (South),	CS 10	2	0.025	0.002	berries	0.05	0[a]	AF/5840/SY,
Ornacieux						0.11	0	AF/5840/SY/2
						0.07	3	
2001						0.03	7	Goodband, 2002b
(Andeca)						0.03	14	
France (South),	CS 10	2	0.011	0.0008	berries	0.02	0[a]	RJ3420B,
Mornant						0.07	0	AF/6478/SY/1
						0.06	3	
2002						0.04	7	Ryan, 2003a
(Andegat)						0.03	14	
						0.03	21	
France (South),	CS 10	2	0.026	0.002	berries	0.05	0[a]	RJ3420B,
Mornant						0.14	0	AF/6478/SY/1
						0.12	3	
2002						0.09	7	Ryan, 2003a
(Andegat)						0.06	14	
						0.05	21	
France (South),	CS 10	2	0.011	0.0008	berries	0.03	0[a]	RJ3420B,
Andert						0.07	0	AF/6478/SY/2
						0.06	3	
2002						0.04	7	Ryan, 2003a
(Andert)						0.03	14	
						0.02	21	
France (South),	CS 10	2	0.026	0.002	berries	0.04	0[a]	RJ3420B,
Andert						0.16	0	AF/6478/SY/2
						0.1	3	
2002						0.06	7	Ryan, 2003a
(Andert)						0.07	14	
						0.05	21	

a before last treatment

Table 53 Lambda-cyhalothrin residues in gooseberries following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany,	CS 10	2	0.026	0.0018	berries	< 0.01	0[a]	AF/8747/SY,
Leutershausen						0.02	0	AF/8747/SY/1
						0.02	3	
2005						0.02	7	North, 2006a
(Rote Triumph)						0.01	14	
						0.01	21	

		Application data			Residues data			
Germany,	CS 10	2	0.025	0.0018	berries	0.09	0[a]	AF/8747/SY,
Nottensdorf			0.026	0.0018		0.21	0	AF/8747/SY/2
						0.11	3	
2005						0.08	7	North, 2006a
(Invicta)						0.08	14	
						0.04	20	

a before last treatment

Table 54 Lambda-cyhalothrin residues in grapes following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South),	CS 10	2	0.021	0.0026	bunches of grape	0.02	0[a]	AF/8677/SY,
Besse						0.02	0	AF/8677/SY/1
						0.02	3	
2005						0.02	7	North, 2006d
(Chenin)						0.01	14	
						0.01	21	
France (South),	CS 10	2	0.02	0.003	bunches of grape	< 0.01	0[a]	AF/8677/SY,
Soulbrois						0.02	0	AF/8677/SY/2
						0.02	3	
2005						0.01	7	North, 2006d
(Cabernet)						0.01	14	
						< 0.01	21	
Italy,	CS 10	2	0.02	0.0025	bunches of grape	< 0.01	0[a]	AF/8677/SY,
Poggio Piccoro						< 0.01	0	AF/8677/SY/3
						< 0.01	3	
2005						< 0.01	7	North, 2006d
(Monturi)						< 0.01	14	
						< 0.01	21	
Italy,	CS 10	2	0.02	0.0025	bunches of grape	< 0.01	0[a]	AF/8677/SY,
Poggio Piccoro						< 0.01	0	AF/8677/SY/4
						< 0.01	3	
2005						< 0.01	7	North, 2006d
(Barbera)						< 0.01	14	
						< 0.01	21	
Spain,	CS 10	2	0.022	0.002	bunches of grape	0.01	0[a]	AF/8677/SY,
Malejan						0.05	0	AF/8677/SY/5
						0.03	3	
2005						0.04	7	North, 2006d
(Macabeo)						0.02	14	
						0.02	21	
Spain,	CS 10	2	0.021	0.002	bunches of grape	< 0.01	0[a]	AF/8677/SY,
Zaragoza			0.02	0.002		0.03	0	AF/8677/SY/6
						0.03	3	
2005						0.02	7	North, 2006d
(Garnacha)						0.02	14	
						0.03	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Greece, Labropoulo 2000 (Black Korinth)	CS 10	2	0.016	0.002	grapes, unwashed	< 0.01	0[a]	RJ3161B, GR-00-E201 Clarke, 2002
						0.02	0	
						0.01	3	
						< 0.01	7	
						< 0.01	14	
					grapes, washed	< 0.01	0[a]	
						0.02	0	
						< 0.01	3	
						0.01	7	
						0.01	14	
					raisins, unwashed	0.05	7	
					raisins, washed	0.01	7	
Greece, Xerosfyria 2000 (Black Korinth)	CS 10	2	0.016	0.002	grapes, unwashed	< 0.01	0[a]	RJ3161B, GR-00-E202 Clarke, 2002
						0.01	0	
						< 0.01	3	
						< 0.01	7	
						< 0.01	14	
					grapes, washed	< 0.01	0[1]	
						0.01	0	
						< 0.01	3	
						< 0.01	7	
						< 0.01	14	
					raisins, unwashed	< 0.01	7	
					raisins, washed	0.01	7	
France (South), Labastide du Temple 2001 (Muscat Seeded)	CS 10	1	0.02	0.002	bunches of grape	< 0.01	98	AF/5712/SY, AF/5712/SY/2 (reverse decline study) Greig, 2004
						< 0.01	92	
						< 0.01	70	
						0.02	38	
						0.02	24	
						0.01	7	
					bunches of grape (RAC)	0.01	70	
						0.01	38	
						0.01	24	
						0.01	7	
					raisins	0.03	70	
						0.06	38	
						0.07	24	
						0.04	7	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South), Bouloc	CS 10	1	0.02	0.002	bunches of grape	< 0.01	98	AF/5712/SY,
						0.02	93	AF/5712/SY/1
						0.01	73	(reverse decline study)
2001						0.01	52	
(Gamay Seeded)						0.03	29	Greig, 2004
						0.02	7	
					bunches of grape (RAC)	0.01	73	
						0.01	52	
						0.03	29	
						0.02	7	
					must (red)	< 0.01	73	
						< 0.01	52	
						< 0.01	29	
						0.01	7	
					wet pomace (red wine)	0.05	73	
						0.08	52	
						0.17	29	
						0.1	7	
					dry pomace (red wine)	0.12	73	
						0.23	52	
						0.31	29	
						0.25	7	
					AF wine (red wine)	< 0.01	73	
						< 0.01	52	
						< 0.01	29	
					lees (red wine)	< 0.01	7	
						< 0.01	73	
						< 0.01	52	
						< 0.01	29	
					young wine (red wine)	< 0.01	7	
						< 0.01	73	
						< 0.01	52	
						< 0.01	29	
					6M wine (red wine)	< 0.01	7	
						< 0.01	73	
						< 0.01	52	
						< 0.01	29	
					juice (red)	< 0.01	7	
						< 0.01	73	
						< 0.01	52	
						< 0.01	29	
						< 0.01	7	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Italy, Conselice	CS 10	1	0.02	0.002	bunches of grape	< 0.01	76	AF/5712/SY, AF/5712/SY/3 (reverse decline study)
						0.02	69	
2001 (Trebbiano Seeded)						0.02	43	
						0.03	31	
						0.06	24	Greig, 2004
						0.02	6	
					bunches of grape (RAC)	< 0.01	43	
						0.01	31	
						0.02	24	
						0.02	6	
					must (white)	< 0.01	43	
						< 0.01	31	
						< 0.01	24	
						< 0.01	6	
					wet pomace (white wine)	0.02	43	
						0.04	31	
						0.13	24	
						0.07	6	
					dry pomace (white wine)	0.06	43	
						0.12	31	
						0.31	24	
						0.19	6	
					must deposit (white wine)	< 0.01	43	
						< 0.01	31	
						< 0.01	24	
						0.02	6	
					AF wine (white wine)	< 0.01	43	
						< 0.01	31	
						< 0.01	24	
						< 0.01	6	
					young wine (white wine)	< 0.01	43	
						< 0.01	31	
						< 0.01	24	
						< 0.01	6	
					6M wine (white wine)	< 0.01	43	
						< 0.01	31	
						< 0.01	24	
						< 0.01	6	
					juice (white)	< 0.01	43	
						< 0.01	31	
						< 0.01	24	
						< 0.01	6	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Italy,	CS 10	1	0.02	0.002	bunches of grape	0.03	60	AF/5712/SY,
Tebano						< 0.01	53	AF/5712/SY/4
						0.01	31	(reverse decline study)
2001						0.02	22	
(Canner Seedless)						0.02	14	Greig, 2004
						0.01	8	
					bunches of grape (RAC)	< 0.01	31	
						0.02	22	
						0.02	14	
					raisins	< 0.01	8	
						0.04	31	
						0.07	22	
						0.04	14	
						0.03	8	

a before last treatment

Table 55 Lambda-cyhalothrin residues in raspberries following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (North),	EC 5	2	0.03	0.002	berries	0.08	7	AF/4161/ZE,
St. Denis des Monts								AF/4161/ZE/2
1998								Cowley, 1999
(Scepter)								
France (North),	EC 5	2	0.026	0.002	berries	0.03	7	AF/4161/ZE,
St. Hilaire St. Mesmin								AF/4161/ZE/3
1998								Cowley, 1999
(Heritage)								
United Kingdom,	EC 5	2	0.029	0.002	berries	0.01	7	17656,
East Malling								GB52-98-S171/02
1998								Old, 1999a
(Malling Leo)								
United Kingdom,	EC 5	2	0.029	0.002	berries	0.04	7	17656,
East Malling								GB52-98-S172/04
1998								Old, 1999a
(Glen Prosen)								
France (South),	CS 10	2	0.025	0.002	berries	0.01	0[a]	AF/5841/SY,
Restau						0.06	0	AF/5841/SY/1
						0.03	3	
2001						0.02	7	Goodband, 2002a
(Otoblisse)						< 0.01	14	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South),	CS 10	2	0.027	0.002	berries	< 0.01	0[a]	AF/5841/SY,
Feugarolles						0.11	0	AF/5841/SY/2
						0.08	3	
2001						0.04	7	Goodband, 2002a
(Heritage)						0.02	14	
France (South),	CS 10	2	0.029	0.002	berries	0.02	0[a]	RJ3413B,
Restau						0.09	0	AF/6491/SY/1
						0.03	3	
2002						0.02	7	Ely, 2003a
(Otoblisse)						0.01	14	
France (South),	CS 10	2	0.026	0.002	berries	0.03	0[a]	RJ3413B,
Brassac						0.14	0	AF/6491/SY/2
						0.14	3	
2002						0.08	7	Ely, 2003a
(Otoblisse)						0.04	14	

a before last treatment

Table 56 Lambda-cyhalothrin residues in strawberries following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
United Kingdom,	CS 10	2	0.013	0.0016	fruit	< 0.01	3	AF/5859/SY,
Halam						< 0.01	7	AF/5859/SY/1
2001								Goodband, 2002c
(Elsanta)								
United Kingdom,	CS 10	2	0.025	0.003	fruit	< 0.01	3	AF/5859/SY,
Halam						< 0.01	7	AF/5859/SY/1
2001								Goodband, 2002c
(Elsanta)								
United Kingdom,	CS 10	2	0.013	0.0016	fruit	< 0.01	3	AF/5859/SY,
Burntwood						< 0.01	7	AF/5859/SY/2
2001								Goodband, 2002c
(Elsanta)								
United Kingdom,	CS 10	2	0.025	0.003	fruit	< 0.01	3	AF/5859/SY,
Burntwood						< 0.01	7	AF/5859/SY/2
2001								Goodband, 2002c
(Elsanta)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (North), Contres	CS 10	2	0.013	0.0016	fruit	< 0.01	3	AF/5859/SY,
						< 0.01	7	AF/5859/SY/3
2001 (Cigaline)								Goodband, 2002c
France (North), Contres	CS 10	2	0.025	0.003	fruit	0.02	3	AF/5859/SY,
						< 0.01	7	AF/5859/SY/3
2001 (Cigaline)								Goodband, 2002c
France (North), Les Alluets-le-Roi	CS 10	2	0.013	0.0016	fruit	< 0.01	3	AF/5859/SY,
						< 0.01	7	AF/5859/SY/4
2001 (Mara des Bois)								Goodband, 2002c
France (North), Les Alluets-le-Roi	CS 10	2	0.025	0.003	fruit	< 0.01	3	AF/5859/SY,
						< 0.01	7	AF/5859/SY/4
2001 (Mara des Bois)								Goodband, 2002c
United Kingdom, Dullingham	EC 5	2	0.024	0.0024	fruit	0.45	0	M4890B,
						0.25	3	GB52-88-S700
						0.24	7	
1988 (Hedley)						0.13	14	Tummon, 1989
United Kingdom, Peasmarsh Rye	EC 5	2	0.024	0.0024	fruit	0.01	0	M4890B,
						0.02	3	GB52-88-S700-1
						0.02	7	
1988 (Hapil)						0.02	14	Tummon, 1989
Spain, Almonte	CS 10	2	0.015	0.0025	fruit	0.02	0[a]	20088,
						0.03	0	AF/5092/ZE/1
						0.02	3	
2000 (Camarosa)						0.02	7	Old, 2001
						< 0.01	14	
Spain, Almonte	CS 10	2	0.025	0.005	fruit	0.02	0[a]	20088,
						0.07	0	AF/5092/ZE/1
						0.05	3	
2000 (Camarosa)						0.04	7	Old, 2001
						0.01	14	
Spain, El Viso del Alcor	CS 10	2	0.015	0.0025	fruit	0.01	0[a]	20088,
						0.08	0	AF/5092/ZE/2
						0.06	3	
2000 (Camarosa)						0.02	7	Old, 2001
						0.01	14	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain,	CS 10	2	0.025	0.005	fruit	0.02	0[a]	20088,
El Viso del Alcor						0.18	0	AF/5092/ZE/2
						0.09	3	
2000						0.07	7	Old, 2001
(Camarosa)						0.03	14	
Italy,	CS 10	2	0.015	0.0025	fruit	< 0.01	0[a]	20088,
San Giorgio di Piano						< 0.01	0	AF/5092/ZE/3
						< 0.01	3	
2000						< 0.01	7	Old, 2001
(Miss)						< 0.01	14	
Italy,	CS 10	2	0.025	0.005	fruit	< 0.01	0[a]	20088,
San Giorgio di Piano						0.02	0	AF/5092/ZE/3
						< 0.01	3	
2000						0.01	7	Old, 2001
(Miss)						0.01	14	
Italy,	CS 10	2	0.015	0.0025	fruit	< 0.01	0[a]	20088,
Maccaretolo						< 0.01	0	AF/5092/ZE/4
						< 0.01	3	
2000						< 0.01	7	Old, 2001
(Honeoyl)						0.01	14	
Italy,	CS 10	2	0.025	0.005	fruit	< 0.01	0[a]	20088,
Maccaretolo						0.01	0	AF/5092/ZE/4
						0.02	3	
2000						< 0.01	7	Old, 2001
(Honeoyl)						0.01	14	
France (South),	CS 10	2	0.015	0.003	fruit	< 0.01	0[a]	19907,
Resteau						0.02	0	AF/5240/ZE/1
						0.02	3	
2000						< 0.01	7	Old, 2001a
(Mara des Bois)						< 0.01	14	
France (South),	CS 10	2	0.025	0.005	fruit	< 0.01	0[a]	19907,
Resteau						0.03	0	AF/5240/ZE/1
						0.02	3	
2000						0.02	7	Old, 2001a
(Mara des Bois)						< 0.01	14	
France (South),	CS 10	2	0.025	0.003	fruit	< 0.01	0[a]	19907,
Cendrieux						0.02	0	AF/5240/ZE/2
						0.01	3	
2000						< 0.01	7	Old, 2001a
(Seascape)						< 0.01	14	
France (South),	CS 10	2	0.025	0.005	fruit	< 0.01	0[a]	19907,
Cendrieux						0.04	0	AF/5240/ZE/2
						0.03	3	
2000						0.02	7	Old, 2001a
(Seascape)						< 0.01	14	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South),	CS 10	2	0.025	0.0025	fruit	< 0.01	0[a]	AF/8633/SY,
Puygaillard de						0.02	0	AF/8633/SY/1
Lomagne						0.02	1	
						0.01	3	North, 2006c
2005						< 0.01	7	
(Sirene)						< 0.01	14	
Italy,	CS 10	2	0.025	0.003	fruit	< 0.01	0[a]	AF/8633/SY,
Emilia Romagna						0.06	0	AF/8633/SY/2
						0.04	1	
2005						0.02	3	North, 2006c
(Maya)						0.01	7	
						< 0.01	14	
Italy,	CS 10	2	0.025	0.003	fruit	< 0.01	0[a]	AF/8633/SY,
Poggio Renatico						0.03	0	AF/8633/SY/3
						0.02	1	
2005						0.02	3	North, 2006c
(Aroza)						0.01	7	
						< 0.01	14	
France (South),	CS 10	2	0.013	0.0015	fruit	< 0.01	3	AF/5860/SY,
Moulis						< 0.01	7	AF/5860/SY/1
						< 0.01	14	
2001								Goodband, 2002e
(Ciloe)								
France (South),	CS 10	2	0.025	0.003	fruit	0.02	3	AF/5860/SY,
Moulis						< 0.01	7	AF/5860/SY/1
						< 0.01	14	
2001								Goodband, 2002e
(Ciloe)								
France (South),	CS 10	2	0.013	0.0015	fruit	0.03	3	AF/5860/SY,
Atur						0.03	7	AF/5860/SY/2
						0.01	14	
2001								Goodband, 2002e
(Seascape)								
France (South),	CS 10	2	0.025	0.003	fruit	0.08	3	AF/5860/SY,
Atur						0.05	7	AF/5860/SY/2
						0.02	14	
2001								Goodband, 2002e
(Seascape)								
Italy,	CS 10	2	0.013	0.0015	fruit	0.02	3	AF/5860/SY,
Argelato						< 0.01	7	AF/5860/SY/3
						< 0.01	14	
2001								Goodband, 2002e
(Miss)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Italy, Argelato	CS 10	2	0.025	0.003	fruit	0.02	3	AF/5860/SY,
						0.02	7	AF/5860/SY/3
						< 0.01	14	
2001 (Miss)								Goodband, 2002e
Italy, Maccaretolo	CS 10	2	0.013	0.0015	fruit	0.01	3	AF/5860/SY,
						0.01	7	AF/5860/SY/4
						< 0.01	14	
2001 (Idea)								Goodband, 2002e
Italy, Maccaretolo	CS 10	2	0.025	0.003	fruit	0.03	3	AF/5860/SY,
						0.01	7	AF/5860/SY/4
						< 0.01	14	
2001 (Idea)								Goodband, 2002e
France (South), Labastide du Temple	CS 10	2	0.013	0.0016	fruit	0.02	3	AF/5581/SY,
						0.02	7	AF/5581/SY/1
2001 (Ciloe)								Goodband, 2002d
France (South), Labastide du Temple	CS 10	2	0.025	0.003	fruit	0.03	3	AF/5581/SY,
						0.02	7	AF/5581/SY/1
2001 (Ciloe)					fruit	0.05	3	Goodband, 2002d
					washed fruit	0.05	3	
					jam	0.02	3	
					canned fruits	0.03	3	
					juice	0.01	3	
					wet pomace	0.2	3	
France (South), Puygaillard de Lomagne	CS 10	2	0.013	0.0016	fruit	0.04	3	AF/5581/SY,
						0.03	7	AF/5581/SY/2
2001 (Ciloe)								Goodband, 2002d
France (South), Puygaillard de Lomagne	CS 10	2	0.025	0.003	fruit	0.07	3	AF/5581/SY,
						0.04	7	AF/5581/SY/2
2001 (Ciloe)					fruit	0.11	3	Goodband, 2002d
					washed fruit	0.09	3	
					jam	0.08	3	
					canned fruits	0.11	3	
					juice	0.03	3	
					wet pomace	0.22	3	

a before last treatment

Table 57 Lambda-cyhalothrin residues in olives following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Italy,	EC 5	2	0.01	0.002	fruit	0.35	0	17871,
Pomezia						0.23	3	IT40-98-E332
						0.25	7	
1998						0.12	10	Old, 1999b
(Leccino)						0.12	14	
Italy,	EC 5	2	0.016	0.002	fruit	0.09	0	17871,
Longiano						0.07	3	IT40-98-E333
						0.07	7	
1998						0.09	10	Old, 1999b
(Frantoio)						0.08	14	
Spain,	EC 5	2	0.008	0.002	fruit	0.82	0	17870,
Chucena			0.012	0.002		0.4	3	ES10-98-SE011
						0.42	7	
1998						0.4	11	Old, 1999c
(Arbequina)						0.31	14	
						0.41	21	
Spain,	EC 5	2	0.02	0.002	fruit	0.16	0	17870,
Chucena			0.022	0.002		0.18	3	ES10-98-SE111
						0.18	7	
1998						0.25	11	Old, 1999c
(Verdial)						0.15	14	
						0.1	21	
Spain,	CS 10	2	0.021	0.002	fruit	0.12	7	AF/7928/SY,
El Viso de Alcor			0.02	0.002				AF/7928/SY/1
2004								Stevenson, 2005a
(Martena)								
Spain,	CS 10	2	0.02	0.002	fruit	0.12	0[a]	AF/7928/SY,
Carmona			0.021	0.002		0.5	0	AF/7928/SY/2
						0.47	3	
2004						0.34	7	Stevenson, 2005a
(Arbequina)						0.41	10	
						0.39	14	
						0.22	21	
Italy,	CS 10	2	0.02	0.002	fruit	0.18	7	AF/7928/SY,
Lazio			0.022	0.002				AF/7928/SY/3
2004								Stevenson, 2005a
(Leccino)								
Italy,	CS 10	2	0.019	0.002	fruit	0.02	0[a]	AF/7928/SY,
Firenze			0.021	0.002		0.05	0	AF/7928/SY/4
						0.04	3	
2004						0.03	7	Stevenson, 2005a
(Frantoio)						0.04	10	
						0.03	14	
						0.05	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain, Lucena	EC 5	2	0.014	0.002	fruit	0.05	29[b]	AF/4733/ZE, AF/4733/ZE/1
						0.06	36[b]	
						0.02	43[b]	
2000 (Hojiblanca)					washed olives	0.05	29[b]	Brereton, 2001
			0.014	0.002		0.04	43[b]	
					cake	0.03	29[2]	
						0.02	43[b]	
					virgin oil	0.02	29[b]	
						0.01	43[b]	
					refined oil	0.02	29[b]	
						0.02	43[b]	
					fruit	0.13	8	
						0.1	15	
						0.06	22	
					washed olives	0.12	8	
						0.06	22	
					cake	0.1	8	
						0.05	22	
					virgin oil	0.06	8	
						0.07	22	
					refined oil	0.08	8	
						0.02	22	
Spain, Lucena	EC 5	2	0.005	0.002	fruit	0.01	28[b]	AF/4733/ZE, AF/4733/ZE/2
						0.02	35[b]	
						0.01	42[b]	
2000 (Hojiblanca)					washed olives	0.03	28[b]	Brereton, 2001
						0.02	42[b]	
					cake	0.02	28[b]	
						0.02	42[b]	
					virgin oil	0.01	28[b]	
						< 0.01	42[b]	
					refined oil	< 0.01	28[b]	
						< 0.01	42[b]	
			0.005	0.002	fruit	0.03	8	
						0.02	15	
						0.01	22	
					washed olives	0.04	8	
						0.02	22	
					cake	0.03	8	
						0.01	22	
					virgin oil	0.03	8	
						< 0.01	22	
					refined oil	< 0.01	8	
						< 0.01	22	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain,	EC 5	2	0.014	0.002	fruit	0.03	29[b]	AF/4733/ZE,
Llanos del Espinar						0.03	35[b]	ES50-99-S031
						0.03	43[b]	
2000			0.014					Brereton, 2001
(Hojiblanca)				0.002		0.06	8	
						0.04	14	
						0.03	22	
Spain,	EC 5	2	0.007	0.002	fruit	0.03	26[b]	AF/4733/ZE,
Pedrera						0.01	33[b]	ES50-99-S131
						0.01	40[b]	
2000								Brereton, 2001
(Hojiblanca)			0.007	0.002		0.06	7	
						0.02	14	
						0.02	21	

a before last treatment

b after first treatment

Table 58 Lambda-cyhalothrin residues in mangoes following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	g ai/tree	g ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Thailand,	EC 2.5	4	0.05	1.25	whole fruit[a]	0.52	0	CHYA-MG-01,
Aumpur Kabinburi Prajeenburi Province						0.35	1	
						0.14	3	Mungnimitr, 1999
						0.02	5	
1999						0.02	7	
(Namdokmai FI 345)						0.01	10	
						0.01	14	
Thailand,	EC 2.5	4	0.05	1.25	whole fruit[a]	0.37	0	CHYA-MG-02,
Chalermprageat Nakornratchasima Province						0.26	1	
						0.22	3	Mungnimitr, 2000
						0.02	5	
2000						0.01	7	
(Numdogmai FI 345)						< 0.01	10	
						< 0.01	14	
Thailand,	EC 2.5	4	0.05	1.25	whole fruit[a]	0.35	0	CHYA-MG-03,
Ampur Viset-Chaichan Ang Thong Province						0.3	1	
						0.1	3	Pimpan, 2004
						0.07	5	
2004						0.02	7	
(Bumdokmai)						0.02	10	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	g ai/tree	g ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Thailand, Aumpur Plangyao Chachungsao Province 2006 (Numdogmai FI 345)	EC 2.5	4	0.05	1.25	whole fruit[a]	0.1 0.05 0.04 0.07 0.03 0.02 0.01	0 1 3 5 7 10 14	CHYA-MG-04, Mungnimitr, 2006
Thailand, Aumpur Panomsalakram Chachungsao Province 2006 (Numdogmai FI 345)	EC 2.5	4	0.05	1.25	whole fruit[a]	0.21 0.07 0.04 0.04 0.04 0.02 0.01	0 1 3 5 7 10 14	CHYA-MG-05, Mungnimitr, 2007

a whole fruit calculated – assumed stone weight of 10 %

Table 59 Lambda-cyhalothrin residues in dry onions following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA, Munson (CA) 1990 (Fresno Red)	EC 12	8	0.034		dry bulbs l.-cyhalothrin: R157836: Compound Ia: Compound V:	 0.05, 0.06 (0.06) 0.01, 0.01 (0.01) < 0.01 < 0.01	14	RR91-062B, 18-CA-90-751 McKay, 1992
USA, Five Points (CA) 1990 (Fresno Red)	EC 12	8	0.034		dry bulbs l.-cyhalothrin: R157836:	 < 0.01 < 0.01	14	RR91-062B, 18-CA-90-752 McKay, 1992
USA, Greeley (CO) 1990 (Brown Beauty 80)	EC 12	8	0.034		dry bulbs l.-cyhalothrin: R157836:	 < 0.01, < 0.01 (< 0.01) < 0.01, < 0.01 (< 0.01)	14	RR91-062B, 48-CO-90-753 McKay, 1992
USA, Conklin (MI) 1990 (Spartan Banner 80)	EC 12	8	0.034		dry bulbs l.-cyhalothrin: R157836: Compound Ia: Compound V:	 0.06, 0.05 (0.06) 0.01, 0.01 (0.01) 0.02 < 0.01	14	RR91-062B, 28-MI-90-754 McKay, 1992

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	8	0.034		dry bulbs		14	RR91-062B,
Sodus (NY)					l.-cyhalothrin:	0.04		56-NY-90-755
					R157836:	< 0.01		
1990					Compound Ia:	< 0.01, < 0.01 (< 0.01)		McKay, 1992
(Rip Vanwinkle)					Compound V:	< 0.01, < 0.01 (< 0.01)		
USA,	EC 12	8	0.068		dry bulbs		14	RR91-062B,
Hermiston (OR)					l.-cyhalothrin:	0.02, 0.02 (0.02)		15-OR-90-756
					R157836:	< 0.01, < 0.01 (< 0.01)		
1990					Compound Ia:	0.01		McKay, 1992
(Amber Globe and Yellow Sweet Spanish)					Compound V:	< 0.01		
USA,	EC 12	8	0.034		dry bulbs		14	RR91-062B,
Parma (ID)					l.-cyhalothrin:	0.01		16-ID-90-757
					R157836:	< 0.01		
1990					Compound Ia:	< 0.01		McKay, 1992
(Dia Maru)					Compound V:	< 0.01		
USA,	EC 12	8	0.034		dry bulbs		14	RR91-062B,
Idalou (TX)					l.-cyhalothrin:	< 0.01		13-TX-90-758
					R157836:	< 0.01		
1990								McKay, 1992
(Cimmaron)								
USA,	EC 12	8	0.034		dry bulbs		14	RR91-062B,
Watsonville (CA)					l.-cyhalothrin:	0.05		18-CA-90-771
					R157836:	< 0.01		
1990					Compound Ia:	< 0.01, < 0.01 (< 0.01)		McKay, 1992
(Sweet Spanish)					Compound V:	< 0.01, < 0.01 (< 0.01)		
USA,	EC 12	8	0.034		dry bulbs		14	RR91-062B,
Greeley (CO)					l.-cyhalothrin:	< 0.01, < 0.01 (< 0.01)		48-CO-90-772
1990					R157836:	< 0.01, < 0.01 (< 0.01)		McKay, 1992
(Brown Beauty 80)								

R157836 = (epimer of lambda-cyhalothrin)

Table 60 Lambda-cyhalothrin residues in broccoli following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA, Watsonville (CA)	WG 12	8	0.034		whole plant			RR90-427B,
					l.-cyhalothrin:	0.3	1	18-CA-88-632
						0.23	3	
1988 (Fatura)					R157836:	0.01	1	Francis, 1990s
						0.02	3	
					Compound Ia:	0.01	1	
						0.02	3	
					Compound V:	< 0.01	1	
						< 0.01	3	
USA, Watsonville (CA)	WG 12	8	0.034		whole plant			RR90-427B,
					l.-cyhalothrin:	0.26	1	18-CA-88-633
						0.28	3	
1988 (Cape Queen F-1)					R157836:	0.01	1	Francis, 1990s
						< 0.01	3	
USA, Mercedes (TX)	WG 12	8	0.034		whole plant			RR90-427B,
					l.-cyhalothrin:	0.2	1	12-TX-88-634
						0.08, 0.12 (0.1)	3	
1988 (Southern Comet)					R157836:	< 0.01	1	Francis, 1990s
						< 0.01, < 0.01 (< 0.01)	3	
					Compound Ia:	< 0.01	1	
						< 0.01, < 0.01 (< 0.01)	3	
					Compound V:	< 0.01	1	
						< 0.01, < 0.01 (< 0.01)	3	
USA, Yuma (AZ)	WG 12	8	0.034		whole plant			RR90-427B,
					l.-cyhalothrin:	0.3	1	14-AZ-88-635
						0.15	3	
1988 (Arcadia)					R157836:	0.02	1	Francis, 1990s
						0.01	3	
USA, Hillsboro (OR)	WG 12	8	0.034		whole plant			RR90-427B,
					l.-cyhalothrin:	0.21	1	20-OR-88-636
						0.23	3	Francis, 1990s
1988 (not reported)					R157836:	0.01	1	
						0.01	3	
					Compound Ia:	< 0.01	1	
						< 0.01	3	
					Compound V:	< 0.01	1	
						< 0.01	3	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	WG	8	0.034		whole plant			RR90-427B,
Oxnard (CA)	12				l.-cyhalothrin:	0.27	1	19-CA-88-637
						0.12, 0.08 (0.1)	3	
1988					R157836:	0.02	1	Francis, 1990s
(N.K. Green Duke)						0.01, 0.01 (0.01)	3	
					Compound Ia:	< 0.01	1	
						< 0.01, < 0.01 (< 0.01)	3	
					Compound V:	< 0.01	1	
						< 0.01, < 0.01 (< 0.01)	3	
USA,	EC 3	8	0.034		whole plant			RR90-427B,
Mercedes (TX)					l.-cyhalothrin:	0.09	1	12-TX-89-720
						0.05	3	
1989					R157836:	< 0.01	1	Francis, 1990s
(Southern Comet)						< 0.01	3	
					Compound Ia:	< 0.01	1	
						< 0.01, 0.01 (0.01)	3	
					Compound V:	< 0.01	1	
						< 0.01, < 0.01 (< 0.01)	3	
USA,	EC 3	8	0.034		whole plant			RR90-427B,
Yuma (AZ)					l.-cyhalothrin:	0.04	1	14-AZ-89-721
						0.04	3	
1989					R157836:	< 0.01	1	Francis, 1990s
(Arcadia)						< 0.01	3	
					Compound Ia:	< 0.01	1	
						0.01	3	
					Compound V:	< 0.01	1	
						< 0.01	3	
USA,	EC 3	8	0.034		whole plant			RR90-427B,
Watsonville (CA)					l.-cyhalothrin:	0.21, 0.14 (0.18)	1	18-CA-89-722
						0.12	3	
1989					R157836:	0.01, 0.01 (0.01)	1	Francis, 1990s
(Premium Crop)						< 0.01	3	
					Compound Ia:	0.02	1	
						0.02	3	
					Compound V:	< 0.01	1	
						< 0.01	3	
USA,	EC 1	8	0.034		whole plant			RR90-427B,
Watsonville (CA)					l.-cyhalothrin:	0.03	1	19-CA-89-723
						0.05	3	
1989					R157836:	< 0.01	1	Francis, 1990s
(Atlantic)						< 0.01	3	
					Compound Ia:	< 0.01, < 0.01 (< 0.01)	1	
					Compound V:	< 0.01, < 0.01 (< 0.01)	1	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain,	CS 10	2	0.02	0.005	whole plant	0.03	0[1]	AF/7916/SY,
Cortes						0.07	0	AF/7916/SY/1
						0.08	3	
2005						0.09	7	Stevenson, 2005b
(Maraton)						0.06	10	
Spain,	CS 10	2	0.02	0.005	whole plant	0.05	0[a]	AF/7916/SY,
Utebo						0.07	0	AF/7916/SY/2
						0.08	3	
2005						0.05	7	Stevenson, 2005b
(Maraton)						0.06	10	
Spain,	CS 10	2	0.02	0.005	whole plant	0.03	0[a]	AF/7323/SY,
Cortes						0.11	0	AF/7323/SY/1
						0.08	3	
2004						0.05	7	Oxspring, 2004
(Maraton)						0.04	10	
Spain,	CS 10	2	0.02	0.005	whole plant	0.03	0[a]	AF/7323/SY,
Utebo						0.09	0	AF/7323/SY/2
						0.06	3	
2004						0.05	7	Oxspring, 2004
(Maraton)						0.05	10	

R157836 = (epimer of lambda-cyhalothrin)
a before last treatment

Table 61 Lambda-cyhalothrin residues in cauliflower following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Italy,	EC 5	2	0.025	0.003	whole plant	< 0.01	2	RJ2044B,
Fano								IT10-94-E395
1994								Tummon, 1996
(botrytis L)								
Spain,	EC 5	2	0.02	0.004	whole plant	0.02	3	RJ2107B,
Cabanuelas						0.02	7	ES10-95-SE005
1995								Jones, 1996a
(Rubaco)								
France (South)	EC 5	2	0.02	0.004	whole plant	< 0.01	2	RJ1989B,
St. Reany de Provence								S340.95
1994								Jones, 1995a
(Rhonia)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South) Germond Rouvre	EC 5	2	0.02	0.007	whole plant	< 0.01	2	RJ1989B, S601.95
1994 (Nautilus)								Jones, 1995a
France (South) Le Vas	EC 5	2	0.02	0.007	whole plant	0.04	2	RJ1990B, S324.94
1994 (Castlegrand)								Jones, 1995b
France (South) Le Montell	EC 5	2	0.02	0.007	whole plant	< 0.01	2	RJ1990B, S602.94
1994 (Linday)								Jones, 1995b

Table 62 Lambda-cyhalothrin residues in cabbage following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain, Amposta	CS 10	2	0.025	0.005	whole plant	0.01 0.04 0.08	0[a] 0 3	20094, 398209/2
2000 (Savoy King)						0.02 0.01	7 14	Old, 2001b
France (South) Miribel	CS 10	2	0.025	0.005	whole plant	< 0.01 0.01 0.01	0[a] 0 3	20094, 398209/3
2000 (Zerlila)						< 0.01 < 0.01	7 14	Old, 2001b
France (South), La Roque d´Antheron	EC 5	2	0.018	0.002	whole plant	0.07 0.23 0.17	0[a] 0 3	18932, 394555T1
1999 (Wirosa)						0.12 0.13 0.12	5 7 10	Old, 2004
France (South), St. Remy de Provence	EC 5	2	0.018	0.002	whole plant	0.04 < 0.01 0.08	0[a] 0 3	18932, 394555T2
1999 (Wirosa)						0.02 0.02 0.04	5 7 10	Old, 2004
Spain, Arguedas	EC 5	2	0.018	0.002	whole plant	0.09 0.1 0.13	0[a] 0 3	18932, 394555T3

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
2000						0.07	5	Old, 2004
(Gloster)						0.02	7	
						0.12	10	
Spain,	EC 5	2	0.018	0.002	whole plant	0.05	0[a]	18932,
Calahorra						0.05	0	394555T4
						0.02	3	
2000						0.02	5	Old, 2004
(Melisa)						< 0.01	7	
						0.02	10	
USA,	EC 12	8	0.034		whole plant			RR95-095B,
Waterloo (NY)					l-cyhalothrin:	0.36	1	57-NY-95-201
						0.2	1	
1995					R157836:	0.05	1	Francis, 1996
(Market Prize)						0.03	1	
USA,	EC 12	8	0.034		whole plant			RR95-095B,
La Feria (TX)					l-cyhalothrin:	0.37	1	25-TX-95-202
						0.55	1	
1995					R157836:	0.05	1	Francis, 1996
(Blue Vantage)						0.06	1	
USA,	EC 12	8	0.034		whole plant			RR95-095B,
Visalia (CA)					l-cyhalothrin:	0.45	1	02-CA-95-203
						0.67	1	
1995					R157836:	0.06	1	Francis, 1996
(Germadier)						0.09	1	
USA,	CS 12	8	0.034		whole plant			RR95-095B,
Waterloo (NY)					l-cyhalothrin:	0.46	1	57-NY-95-201
						0.39	1	
1995					R157836:	0.06	1	Francis, 1996
(Market Prize)						0.05	1	
USA,	CS 12	8	0.034		whole plant			RR95-095B,
La Feria (TX)					l-cyhalothrin:	0.41	1	25-TX-95-202
						0.4	1	
1995					R157836:	0.06	1	Francis, 1996
(Blue Vantage)						0.05	1	
USA,	CS 12	8	0.034		whole plant			RR95-095B,
Visalia (CA)					l-cyhalothrin:	0.52	1	02-CA-95-203
						0.24, 0.29 (0.27)	1	
1995					R157836:	0.08	1	Francis, 1996
(Germadier)						0.04, 0.04 (0.04)	1	

a before last treatment

Table 63 Lambda-cyhalothrin residues in spinach following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (North),	CS 10	2	0.0075	0.002	whole plant	0.04	0[a]	20084,
Goury						0.23	0	AF/5089/ZE/1
						0.22	3	
2001						0.05	7	Old, 2002
(Ballet)						0.08	10	
						0.02	14	
					whole plant (RAC)	0.14	3	
					stalk and ribs	0.02	3	
					washed cut leaves	0.17	3	
					cooked leaves	0.26, 0.25, 0.27, 0.27, 0.24, 0.26, 0.26, 0.23 (0.26)	3	
France (North),	CS 10	2	0.0075	0.002	whole plant	0.01	0[a]	20084,
Ecquevilly						0.26	0	AF/5089/ZE/2
						0.12	3	
2001						0.04	7	Old, 2002
(Symphonie)						0.02	10	
						< 0.01	14	
					whole plant (RAC)	0.07	3	
					stalk and ribs	0.01	3	
					washed cut leaves	0.08	3	
					cooked leaves	0.1, 0.1, 0.11(5), 0.12 (0.11)	3	

a before last treatment

Table 64 Lambda-cyhalothrin residues in cucumbers following foliar application (protected)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain,	CS 10	2	0.025	0.0028	fruit	< 0.01	0[a]	AF/5104/ZE,
Los Palacios y Villafranca						< 0.01	0	AF/5104/ZE/1
						< 0.01	3	
						< 0.01	7	Goodband, 2001b
2000						< 0.01	14	
(Dona)								
Spain,	CS 10	2	0.025	0.0028	fruit	< 0.01	0[a]	AF/5104/ZE,
Sanlucar de Barrameda						0.01	0	AF/5104/ZE/2
						< 0.01	3	
						< 0.01	7	Goodband, 2001b
2000						< 0.01	14	
(Darmen 2)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Italy,	CS 10	2	0.033	0.0028	fruit	< 0.01	0[a]	AF/5104/ZE,
S. Lazzaro di Savena			0.027	0.0028		< 0.01	0	AF/5104/ZE/4
						< 0.01	3	
2000						< 0.01	7	Goodband, 2001b
(Akito)						< 0.01	14	
Italy,	CS 10	2	0.025	0.0028	fruit	< 0.01	0[a]	AF/5104/ZE,
Granarolo						< 0.01	0	AF/5104/ZE/5
						< 0.01	3	
2000						< 0.01	7	Goodband, 2001b
(Darina)						< 0.01	14	

a before last treatment

Table 65 Lambda-cyhalothrin residues in courgettes following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain,	CS 10	2	0.025	0.003	fruit	< 0.01	0[a]	AF/5098/ZE,
Zaragoza						0.03	0	AF/5098/ZE/1
						0.01	3	
2000						< 0.01	7	Goodband, 2001c
(Diamante)						< 0.01	14	
Italy,	CS 10	2	0.025	0.003	fruit	< 0.01	0[a]	AF/5098/ZE,
Granarolo						0.06	0	AF/5098/ZE/2
						< 0.01	3	
2000						< 0.01	7	Goodband, 2001c
(Niedla)						< 0.01	14	
Italy,	CS 10	2	0.025	0.003	fruit	< 0.01	0[a]	AF/5098/ZE,
San Giorgio di Piano						< 0.01	0	AF/5098/ZE/3
						< 0.01	3	
2000						< 0.01	7	Goodband, 2001c
(Zucchino Bolognese)						< 0.01	14	
Italy,	EC 3	4	0.025	0.0025	fruit	0.01	2	RJ1623B,
Terracina								IT10-93-E325
1993								Bonfanti, 1994
(President)								
Italy,	EC 3	4	0.025	0.0025	fruit	0.01	2	RJ1623B,
Veneto								IT10-93-E326
1993								Bonfanti, 1994
(Diamant)								
Italy,	EC 5	4	0.025	0.0025	fruit	0.01	2	RJ2126B,
Terracina								IT10-94-E380
1994								Tummon, 1996a

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
(President)								
Italy, Masi di Colombare	EC 5	4	0.025	0.0025	fruit	0.01	2	RJ2126B, IT10-94-E381
1994 (Diamant)								Tummon, 1996a

a before last treatment

Table 66 Lambda-cyhalothrin residues in melons following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (North), Coutures	CS 10	2	0.02	0.004	whole fruit	< 0.01	0[a]	AF/8625/SY,
						< 0.01	0	AF/8625/SY/1
						< 0.01	1	
2005 (Indola)					pulp	< 0.01	3	North, 2006e
						< 0.01	7	
						< 0.01	10	
					peel	0.01	3	
						< 0.01	7	
						< 0.01	10	
France (North) Le Plessis Grammoire	CS 10	2	0.02	0.003	whole fruit	< 0.01	0[a]	AF/8625/SY,
						< 0.01	0	AF/8625/SY/1
						< 0.01	1	
2005 (Galia Total)					pulp	< 0.01	3	North, 2006e
						< 0.01	7	
						< 0.01	10	
					peel	0.01	3	
						0.01	7	
						0.01	10	
France (North), La Roche Rigault	CS 10	2	0.0075	0.002	whole fruit[2]	< 0.01	3	AF/5866/SY,
					pulp	< 0.01		AF/5866/SY/1
					peel	0.01		
2001 (Nougaro)								Greig, 2003
France (North), La Roche Rigault	CS 10	2	0.02	0.005	whole fruit[2]	< 0.01	3	AF/5866/SY,
					pulp	< 0.01		AF/5866/SY/1
					peel	0.02		
2001 (Nougaro)								Greig, 2003
France (North), Marigny-Marmande	CS 10	2	0.0075	0.002	whole fruit[2]	< 0.01	3	AF/5866/SY,
					pulp	< 0.01		AF/5866/SY/2
					peel	< 0.01		
2001 (Amigo)								Greig, 2003

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (North), Marigny-Marmande	CS 10	2	0.02	0.005	whole fruit[2]	< 0.01	3	AF/5866/SY, AF/5866/SY/2
					pulp	< 0.01		
					peel	0.02		
2001 (Amigo)								Greig, 2003
France (North), Veuves	CS 10	2	0.0075	0.0013	whole fruit	< 0.01	0[a]	AF/5109/ZE, AF/5109/ZE/1
						< 0.01	0	
						< 0.01	1	
2000 (Amigo)						< 0.01[b]	3	Oxspring, 2001
					pulp	< 0.01	3	
					peel	< 0.01	3	
France (North), Veuves	CS 10	2	0.02	0.004	whole fruit	< 0.01	0[a]	AF/5109/ZE, AF/5109/ZE/1
						< 0.01	0	
						< 0.01	1	
2000 (Amigo)						< 0.01[b]	3	Oxspring, 2001
					pulp	< 0.01	3	
					peel	0.01	3	
France (North), Vix	CS 10	2	0.0075	0.0013	whole fruit	< 0.01	0[a]	AF/5109/ZE, AF/5109/ZE/2
						< 0.01	0	
						< 0.01	1	
2000 (Heliobel)						< 0.01[b]	3	Oxspring, 2001
					pulp	< 0.01	3	
					peel	< 0.01	3	
France (North), Vix	CS 10	2	0.02	0.004	whole fruit	< 0.01	0[a]	AF/5109/ZE, AF/5109/ZE/2
						< 0.01	0	
						< 0.01	1	
2000 (Heliobel)						< 0.01[b]	3	Oxspring, 2001
					pulp	< 0.01	3	
					peel	0.02	3	

a before last treatment

b calculated

Table 67 Lambda-cyhalothrin residues in melons following foliar application (protected)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (North), Allonnes	CS 10	2	0.0075	0.0013	whole fruit [b]	< 0.01	0[a]	AF/5867/SY, AF/5867/SY/1
						< 0.01	0	
						< 0.01	3	
2000 (Amigo)					pulp	< 0.01	0[a]	Goodband, 2002d
						< 0.01	0	
						< 0.01	3	
					peel	< 0.01	0[a]	
						< 0.01	0	
						0.02	3	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (North),	CS 10	2	0.02	0.004	whole fruit [b]	< 0.01	0[a]	AF/5867/SY,
Allonnes						< 0.01	0	AF/5867/SY/1
						< 0.01	3	
2000					pulp	< 0.01	0[a]	Goodband, 2002d
(Amigo)						< 0.01	0	
						< 0.01	3	
					peel	0.01	0[a]	
						0.02	0	
						0.02	3	
France (North),	CS 10	2	0.0075	0.0013	whole fruit [b]	< 0.01	3	AF/5867/SY,
Orgerus					pulp	< 0.01	3	AF/5867/SY/2
					peel	0.03	3	
2000								Goodband, 2002d
(Delta)								
France (North),	CS 10	2	0.02	0.004	whole fruit [b]	0.02	3	AF/5867/SY,
Orgerus					pulp	< 0.01	3	AF/5867/SY/2
					peel	0.06	3	
2000								Goodband, 2002d
(Delta)								
France (North),	CS 10	2	0.0075	0.0013	whole fruit [b]	< 0.01	3	AF/5867/SY,
Perigny					pulp	< 0.01	3	AF/5867/SY/3
					peel	< 0.01	3	
2000								Goodband, 2002d
(Buffalo)								
France (North),	CS 10	2	0.02	0.004	whole fruit [b]	< 0.01	3	AF/5867/SY,
Perigny					pulp	< 0.01	3	AF/5867/SY/3
					peel	0.03	3	
2000								Goodband, 2002d
(Buffalo)								
France (North),	CS 10	2	0.0075	0.0013	whole fruit	< 0.01	0[a]	AF/5111/SY,
Perigny						< 0.01	0	AF/5111/SY/1
						< 0.01	1	
2000						< 0.01[2]	3	Oxspring, 2001a
(Mayol)					pulp	< 0.01	3	
					peel	< 0.01	3	
France (North),	CS 10	2	0.02	0.004	whole fruit	< 0.01	0[a]	AF/5111/SY,
Perigny						< 0.01	0	AF/5111/SY/1
						< 0.01	1	
2000						< 0.01[2]	3	Oxspring, 2001a
(Mayol)					pulp	< 0.01	3	
					peel	< 0.01	3	
France (North),	CS 10	2	0.0075	0.0013	whole fruit	< 0.01	0[a]	AF/5111/SY,
Orgerus						< 0.01	0	AF/5111/SY/3
						< 0.01	1	
2000						< 0.01[2]	3	Oxspring, 2001a
(Buffato)					pulp	< 0.01	3	
					peel	< 0.01	3	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (North),	CS 10	2	0.02	0.004	whole fruit	< 0.01	0[a]	AF/5111/SY,
Orgerus						< 0.01	0	AF/5111/SY/3
						< 0.01	1	
2000						< 0.01[2]	3	Oxspring, 2001a
(Buffato)					pulp	< 0.01	3	
					peel	0.02	3	

a before last treatment

b calculated

Table 68 Lambda-cyhalothrin residues in bell peppers following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	12	0.034	0.03	fruit			RR96-103B,
Whitakers (NC)					l-cyhalothrin:	0.05	5	01-NC-96-551
						0.04	5	
1996					R157836:	< 0.01	5	Markle, 1997
(California Wonder)						< 0.01	5	
USA,	EC 12	12	0.034	0.02	fruit			RR96-103B,
Cornish Point (NJ)					l-cyhalothrin:	0.02	5	70-NJ-96-552
					R157836:	< 0.01	5	
1996								Markle, 1997
(Camelot)								
USA,	EC 12	12	0.034	0.012	fruit			RR96-103B,
Oviedo (FL)					l-cyhalothrin:	0.05	5	42-FL-96-553
						0.05	5	
1996					R157836:	< 0.01	5	Markle, 1997
(California Wonder)						< 0.01	5	
USA,	EC 12	12	0.034	0.015	fruit			RR96-103B,
Ft. Pierce (FL)					l-cyhalothrin:	0.07	5	42-FL-96-554
						0.12	5	
1996					R157836:	< 0.01	5	Markle, 1997
(California Wonder)						< 0.01	5	
					CONTROL:			
					l-cyhalothrin:	0.03		
						0.04		
					R157836:	< 0.01		
						< 0.01		
USA,	EC 12	12	0.034	0.04	fruit			RR96-103B,
Champaign (IL)					l-cyhalothrin:	0.02	5	04-IL-96-555
						0.01	5	
1996					R157836:	< 0.01	5	Markle, 1997
(Bell Captain)						< 0.01	5	
USA,	EC 12	12	0.034	0.04	fruit			RR96-103B,
Yuma (AZ)					l-cyhalothrin:	0.02	5	14-AZ-96-557

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
						0.02, 0.02 (0.02)	5	
1996					R157836:	< 0.01	5	Markle, 1997
(Ivan)						< 0.01	5	
USA,	EC 12	12	0.034	0.04	fruit			RR96-103B,
Visalia (CA)					l-cyhalothrin:	0.01	5	02-CA-96-558
						0.01	5	
1996					R157836:	< 0.01	5	Markle, 1997
(Jupiter)						< 0.01	5	
USA,	EC 12	12	0.034	0.03	fruit			RR96-103B,
St. Paul (TX)					l-cyhalothrin:	0.15	5	25-TX-96-559
						0.15	5	
1996					R157836:	0.01	5	Markle, 1997
(860 Rogers NK)						0.01	5	

R157836 = epimer of lambda-cyhalothrin

Table 69 Lambda-cyhalothrin residues in tomatoes following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	CS 3	12	0.033	0.007	fruit (regular)			484-01,
Vero Beach (FL)					l-cyhalothrin:	0.08, 0.07 (0.08)	5	VB-IR-002-01
						0.1, 0.08 (0.09)	5	
2001					R157836:	0.007	5	Ediger, 2002
(Florida 47)						0.01	5	
USA,	CS 3	12	0.033	0.007	fruit (regular)			484-01,
Visalia (CA)					l-cyhalothrin:	0.06, 0.06 (0.06)	5	W2-IR-002-01
						0.08, 0.07 (0.08)	5	
2000					R157836:	< 0.007	5	Ediger, 2002
(MKT #686)						< 0.007	5	
USA,	CS 3	12	0.033	0.007	fruit (cherry)			484-01,
Vero Beach (FL)					l-cyhalothrin:	0.15, 0.15 (0.15)	5	VB-IR-002-01
						0.14, 0.15 (0.15)	5	
2001					R157836:	0.02, 0.02 (0.02)	5	Ediger, 2002
(Cherry Grande)						0.02, 0.02 (0.02)	5	
USA,	CS 3	12	0.033	0.007	fruit (cherry)			484-01,
Visalia (CA)					l-cyhalothrin:	0.11, 0.14, 0.14, 0.11 (0.13)	5	W2-IR-002-01
2000						0.13, 0.12, 0.11, 0.13 (0.12)	5	Ediger, 2002
(Sweet 100)					R157836:	0.01, 0.01 (0.01)	5	
						0.01, 0.01 (0.01)	5	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA, Alachua (FL)	WG 12	12	0.034		fruit			RR90-414B, 42-FL-88-673
					l-cyhalothrin:	< 0.01	5	
						< 0.01	10	
1988 (Sonny)					R157836:	< 0.01	5	McKay, 1990
						< 0.01	10	
					Compound Ia:	< 0.01	5	
						< 0.01	10	
					Compound V:	< 0.01	5	
						< 0.01	10	
USA, Groveland (FL)	WG 12	12	0.034		fruit			RR90-414B, 42-FL-88-674
					l-cyhalothrin:	0.02	5	
						0.02, 0.02 (0.02)	10	
1988 (Sunny)					R157836:	< 0.01	5	McKay, 1990
						< 0.01	10	
					Compound Ia:	< 0.01	5	
						< 0.01	10	
					Compound V:	< 0.01	5	
						< 0.01	10	
USA, Oneco (FL)	WG 12	12	0.034		fruit			RR90-414B, 42-FL-88-675
					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	5	
1988 (Sunny)						< 0.01	10	McKay, 1990
					R157836:	< 0.01, < 0.01 (< 0.01)	5	
						< 0.01	10	
					Compound Ia:	< 0.01	5	
						< 0.01	10	
					Compound V:	< 0.01	5	
						< 0.01	10	
USA, Brentwood (CA)	WG 12	12	0.034		fruit			RR90-414B, 17-CA-88-678
					l-cyhalothrin:	0.01, < 0.01 (0.01)	5	
						< 0.01	10	
1988 (Heinz 2710)					R157836:	< 0.01, < 0.01 (< 0.01)	5	McKay, 1990
						< 0.01	10	
					Compound Ia:	< 0.01	5	
						< 0.01	10	
					Compound V:	< 0.01	5	
						< 0.01	10	
USA, Sultana (CA)	WG 12	12	0.034		fruit			RR90-414B, 18-CA-88-679
					l-cyhalothrin:	0.02	5	
						0.01	10	
1988 (Jack Pot)					R157836:	< 0.01	5	McKay, 1990
						< 0.01	10	
					Compound Ia:	< 0.01	5	
						< 0.01	10	
					Compound V:	< 0.01	5	
						< 0.01	10	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	WG	12	0.034		fruit			RR90-414B,
Mercedes (TX)	12				l-cyhalothrin:	< 0.01	5	12-TX-88-680
						< 0.01	10	
1988					R157836:	< 0.01	5	McKay, 1990
(Flora-dade)						< 0.01	10	
					Compound Ia:	< 0.01	5	
						< 0.01	10	
					Compound V:	< 0.01	5	
						< 0.01	10	
USA,	WG	12	0.034		fruit			RR90-414B,
Marcellus (MI)	12				l-cyhalothrin:	0.02	5	28-MI-88-681
						0.02, 0.02 (0.02)	10	
1988					R157836:	< 0.01	5	McKay, 1990
(Pik Red)						< 0.01, < 0.01 (< 0.01)	10	
					Compound Ia:	< 0.01	5	
						< 0.01	10	
					Compound V:	< 0.01	5	
						< 0.01	10	
USA,	WG	12	0.034		fruit			RR90-414B,
Penns Grove (NJ)	12				l-cyhalothrin:	0.04	5	57-NJ-88-682
						0.03	10	
1988					R157836:	< 0.01	5	McKay, 1990
(FM6203)						< 0.01	10	
					Compound Ia:	< 0.01	5	
						< 0.01	10	
					Compound V:	< 0.01	5	
						< 0.01	10	
USA,	WG	12	0.034		fruit			RR90-414B,
Clemson (SC)	12				l-cyhalothrin:	< 0.01	5	46-SC-88-683
						< 0.01	10	
1988					R157836:	< 0.01	5	McKay, 1990
(Sunny)						< 0.01	10	
					Compound Ia:	< 0.01	5	
						< 0.01	10	
					Compound V:	< 0.01	5	
						< 0.01	10	
USA,	EC 12	12	0.034		fruit			RR90-414B,
Sultana (CA)					l-cyhalothrin:	0.04	5	18-CA-89-660
					R157836:	< 0.01	5	
1989					Compound Ia:	< 0.01	5	McKay, 1990
(Jack Pot)					Compound V:	< 0.01	5	
USA,	EC 12	12	0.034		fruit			RR90-414B,
Groveland (FL)					l-cyhalothrin:	0.05, 0.03 (0.04)	5	42-FL-89-661
					R157836:	< 0.01, < 0.01 (< 0.01)	5	
1989								McKay, 1990
(Sunny)					Compound Ia:	< 0.01	5	
					Compound V:	< 0.01	5	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	12	0.034		fruit			RR90-414B,
Oxford (FL)					l-cyhalothrin:	0.06	5	42-FL-89-662
					R157836:	< 0.01	5	
1989					Compound Ia:	< 0.01	5	McKay, 1990
(not reported)					Compound V:	< 0.01	5	
USA,	EC 12	12	0.034		fruit			RR90-414B,
Columbus (OH)					l-cyhalothrin:	0.04	5	75-OH-89-666
					R157836:	< 0.01	5	
1989					Compound Ia:	< 0.01, < 0.01 (< 0.01)	5	McKay, 1990
(Heinz 8245)					Compound V:	< 0.01, < 0.01 (< 0.01)	5	
USA,	EC 12	10	0.034		fruit			RR95-095B,
Oviedo (FL)					l-cyhalothrin:	0.02	5	42-FL-95-211
						0.02	5	
1995					R157836:	< 0.01	5	Francis, 1996
(Better Boy)						< 0.01	5	
USA,	EC 12	10	0.034		fruit			RR95-095B,
Noblesville (IN)					l-cyhalothrin:	0.03	5	67-IN-95-213
						0.02	5	
1995					R157836:	< 0.01	5	Francis, 1996
(Burpee Big Boy)						< 0.01	5	
USA,	EC 12	10	0.034		fruit			RR95-095B,
Visalia (CA)					l-cyhalothrin:	0.04	5	02-CA-95-214
1995						0.04	5	
(Shady Lady)					R157836:	< 0.01	5	Francis, 1996
						< 0.01	5	
USA,	CS 12	10	0.034		fruit			RR95-095B,
Oviedo (FL)					l-cyhalothrin:	0.01	5	42-FL-95-211
						0.01	5	
1995					R157836:	< 0.01	5	Francis, 1996
(Better Boy)						< 0.01	5	
USA,	CS 12	10	0.034		fruit			RR95-095B,
Noblesville (IN)					l-cyhalothrin:	0.03	5	67-IN-95-213
						0.02, 0.02 (0.02)	5	
1995					R157836:	< 0.01	5	Francis, 1996
(Burpee Big Boy)						< 0.01	5	
USA,	CS 12	10	0.034		fruit			RR95-095B,
Visalia (CA)					l-cyhalothrin:	0.03	5	02-CA-95-214
						0.03, 0.03, (0.03)	5	
1995					R157836:	< 0.01	5	Francis, 1996
(Shady Lady)						< 0.01	5	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA, Oxford (FL) 1989 (Heat Wave)	EC 12	12	0.034 (10×) 0.17 (2×)		fruit l-cyhalothrin: R157836: Compound Ia: Compound V: fruits (RAC): l-cyhalothrin: R157836: Compound Ia: Compound V: wet pomace l-cyhalothrin: R157836: Compound Ia: Compound V: dry pomace l-cyhalothrin: R157836: Compound Ia: Compound V: puree l-cyhalothrin: R157836: Compound Ia: Compound V: ketchup l-cyhalothrin: R157836: Compound Ia: Compound V: paste l-cyhalothrin: R157836: Compound Ia: Compound V:	 0.24, 0.24, 0.21, 0.25, 0.2 (0.23) 0.02, 0.02, 0.02, 0.03, 0.02 (0.02) < 0.01 < 0.01 0.38, 0.3, 0.29 (0.32) 0.04, 0.03, 0.03 (0.03) < 0.01, 0.05 (0.05) 0.14 2.8, 2.7, 3.0, 2.5 (2.8) 0.24, 0.24, 0.42, 0.35 (0.31) < 0.01, < 0.01 (< 0.01) < 0.01, < 0.01 (< 0.01) 19, 20, 16, 16 (18) 1.7, 1.9, 2.2, 2.2 (2.0) 0.05, 0.02 (0.04) 0.03, 0.02 (0.03) 0.08, 0.08 (0.08) 0.02, 0.02 (0.02) < 0.01 < 0.01 0.07, 0.07 (0.07) 0.01, 0.01 (0.01) < 0.01, < 0.01 (< 0.01) < 0.01 0.11, 0.09, 0.09, 0.1 (0.1) 0.03, 0.02, 0.02, 0.02 (0.02) < 0.01 < 0.01	 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	RR90-419B, 42-FL-89-730 Gillespie, 1990

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
					juice			
					l-cyhalothrin:	0.03, 0.02, 0.02 (0.02)	5	
					R157836:	< 0.01, < 0.01, < 0.01 (< 0.01)	5	
					Compound Ia:	< 0.01, 0.01 (0.01)	5	
					Compound V:	0.02	5	

R157836 = epimer of lambda-cyhalothrin

Table 70 Lambda-cyhalothrin residues in sweet corn cobs following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	12	0.045		cob + kernels			RR95-095B,
North Rose (NY)					l-cyhalothrin:	0.17	1	57-NY-95-206
						0.18	1	
1995					R157836:	0.03	1	Francis, 1996
(Crusader 4399 LF)						0.03	1	
USA,	EC 12	12	0.045		cob + kernels			RR95-095B,
Oviedo (FL)					l-cyhalothrin:	< 0.01	1	42-FL-95-207
						< 0.01	1	
1995					R157836:	< 0.01	1	Francis, 1996
(Florida Stay Sweet)						< 0.01	1	
USA,	EC 12	12	0.045		cob + kernels			RR95-095B,
Delavan (WI)					l-cyhalothrin:	< 0.01	1	79-WI-95-208
						< 0.01	1	
1995					R157836:	< 0.01	1	Francis, 1996
(Melody)						< 0.01	1	
USA,	CS 12	12	0.045		cob + kernels			RR95-095B,
North Rose (NY)					l-cyhalothrin:	0.14	1	57-NY-95-206
						0.08	1	
1995					R157836:	0.03	1	Francis, 1996
(Crusader 4399 LF)						0.01	1	
USA,	CS 12	12	0.045		cob + kernels			RR95-095B,
Oviedo (FL)					l-cyhalothrin:	< 0.01	1	42-FL-95-207
						< 0.01	1	
1995					R157836:	< 0.01, < 0.01 (< 0.01)	1	Francis, 1996
(Florida Stay Sweet)						< 0.01, < 0.01 (< 0.01)	1	
USA,	CS 12	12	0.045		cob + kernels			RR95-095B,
Delavan (WI)					l-cyhalothrin:	< 0.01	1	79-WI-95-208
						< 0.01	1	
1995					R157836:	< 0.01	1	Francis, 1996
(Melody)						< 0.01	1	

R157836 = epimer of lambda-cyhalothrin

Table 71 Lambda-cyhalothrin residues in beans (green) following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.035	beans with pods			RR96-106B
Williamson (NY)					l-cyhalothrin:	0.02	7	57-NY-96-524
						0.03	7	
1996					R157836:	< 0.01	7	Markle, 1997a
(Long Tendergreen)						< 0.01	7	
USA,	EC 12	4	0.034	0.035	beans with pods			RR96-106B
Whitakers (NC)					l-cyhalothrin:	0.03	7	01-NC-96-525
						0.02	7	
1996					R157836:	< 0.01	7	Markle, 1997a
(Contender)						< 0.01	7	
USA,	EC 12	4	0.034	0.012	beans with pods			RR96-106B
Oviedo (FL)					l-cyhalothrin:	0.01	7	42-FL-96-526
						0.02, 0.02 (0.02)	7	
1996					R157836:	< 0.01	7	Markle, 1997a
(Contender)						< 0.01, < 0.01 (< 0.01)	7	
USA,	EC 12	4	0.034	0.02	beans with pods			RR96-106B
Conklin (MI)					l-cyhalothrin:	0.02	7	04-MI-96-527
						0.02	7	
1996					R157836:	< 0.01	7	Markle, 1997a
(Spartan Arrow)						< 0.01	7	
USA,	EC 12	4	0.034	0.035	beans with pods			RR96-106B
Baraboo (WI)					l-cyhalothrin:	0.02	7	79-WI-96-528
						0.02	7	
1996					R157836:	< 0.01	7	Markle, 1997a
(Early Contender)						< 0.01	7	
USA,	EC 12	5	0.034	0.035	beans with pods			RR96-106B
Ontario (OR)					l-cyhalothrin:	0.02	7	16-OR-96-529
						0.02	7	
1996					R157836:	< 0.01	7	Markle, 1997a
(Gold Mine)						< 0.01	7	
France (South)	CS 10	2	0.025	0.006	beans with pods	< 0.01	0[a]	20090,
Dange St. Romain						0.04	0	398151/T1
						0.04	3	
2001						0.03	7	Old, 2002a
(Booster)						0.03	14	
France (South)	CS 10	2	0.025	0.006	beans with pods	0.01	0[a]	20090,
Dange St. Romain						0.05	0	398151/T2
						0.04	4	
2001						0.04	7	Old, 2002a
(Booster)						0.03	14	
Spain,	CS 10	2	0.025	0.006	beans with pods	0.28	0[a]	20090,
Burgos						1.4	0	398151/T3

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
						0.12	2	
2001						0.02	7	Old, 2002a
(Forum)						< 0.01	13	
Spain,	CS 10	2	0.025	0.006	beans with pods	0.1	0[a]	20090,
Burgos						0.98	0	398151/T4
						0.14	2	REPLICATE
2001						0.02	7	
(Forum)						< 0.01	13	Old, 2002a
Spain,	CS 10	2	0.025	0.006	beans with pods	0.09	0[a]	20090,
Anguciana						1.1	0	398151/T5
						0.03	2	
2001						0.01	7	Old, 2002a
(Bina)						< 0.01	13	
France (South),	CS 10	2	0.025	0.006	beans with pods	0.04	3	20090,
Vaugiere					washed snibbed beans	0.03	3	398151/T6
2001					blanched cooked beans	0.03	3	Old, 2002a
(Valence)					canned beans	0.01, 0.02(7) (0.02)	3	
					beans with pods			
					cooked beans	0.03	3	
						0.03(7), 0.04 (0.03)	3	
Spain,	CS 10	2	0.025	0.005	beans with pods	0.37	3	20090,
Palafolls					washed snibbed beans	0.21	3	398151/T7
2001					blanched cooked beans	0.04	3	Old, 2002a
(Nuria)					canned beans	0.07, 0.1(4), 0.11, 0.14, 0.18 (0.11)	3	
					beans with pods	0.32	3	
					cooked beans	0.16, 0.17, 0.17, 0.18, 0.19, 0.2, 0.21, 0.24 (0.19)	3	

a before last treatment

R157836 = epimer of lambda-cyhalothrin

Table 72 Lambda-cyhalothrin residues in peas (green) following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.02	peas with pods			RR96-106B
Sudlersville (MD)					l-cyhalothrin:	0.04	7	70-MD-96-521
						0.05	7	
1996					R157836:	< 0.01	7	Markle, 1997a
(Oregon Sugarpod #2)						< 0.01	7	
USA,	EC 12	4	0.034	0.02	peas with pods			RR96-106B
Baraboo (WI)					l-cyhalothrin:	0.01	7	79-WI-96-522
						0.01	7	
1996					R157836:	< 0.01	7	Markle, 1997a
(Sugar Snap)						< 0.01	7	
USA,	EC 12	4	0.034	0.02	peas with pods			RR96-106B
Walla Walla (WA)					l-cyhalothrin:	0.11	7	15-WA-96-523
						0.12, 0.1 (0.11)	7	
1996					R157836:	0.01	7	Markle, 1997a
(Oregon Sugarpod)						0.02, 0.01 (0.02)	7	
Spain,	CS 10	2	0.025	0.006	peas w/o pods	< 0.01	0[a]	RJ3430B,
Leiva						< 0.01	0	AF/6485/SY/2
						< 0.01	3	
2003						< 0.01	7	Ryan, 2004b
(Raimias)						< 0.01	10	
Spain,	CS 10	2	0.025	0.006	peas w/o pods	< 0.01	0[a]	RJ3430B,
La Almunia de Dona Godina						< 0.01	0	AF/6485/SY/3
						< 0.01	3	
						< 0.01	7	Ryan, 2004b
2003						< 0.01	10	
(not reported)								
Spain,	CS 10	2	0.025	0.006	peas w/o pods	< 0.01	0[a]	RJ3430B,
Leiva						< 0.01	0	AF/6485/SY/4
2003						< 0.01	3	
(Raimas)								Ryan, 2004b
Spain,	CS 10	2	0.025	0.006	peas w/o pods	< 0.01	0[a]	RJ3430B,
Leiva						< 0.01	0	AF/6485/SY/5
						< 0.01	3	
2003						< 0.01	7	Ryan, 2004b
(Ambassador)						< 0.01	10	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain, Gurrea de Gellego	CS 10	2	0.025	0.006	whole pods	0.01	0[a]	AF/10381/SY,
						0.1	0	AF/10381/SY/1
						0.07	1	
2006						0.06	3	North, 2007
(Valverde)						0.05	7	
						0.03	10	
					remaining plant	0.09	01	
						0.74	0	
						0.57	1	
						0.41	3	
					remaining plant +pod w/o peas	0.39	7	
						0.32	10	
						< 0.01	3	
					peas w/o pods	< 0.01	7	
						< 0.01	10	
Spain, Castillo Pompien	CS 10	2	0.025	0.006	whole pods	0.01	0[a]	AF/10381/SY,
						0.09	0	AF/10381/SY/2
						0.09	1	
2006						0.04	3	North, 2007
(Meteor)						0.04	7	
						0.06	10	
					remaining plant	0.11	01	
						0.58	0	
						0.61	1	
						0.56	3	
					remaining plant +pod w/o peas	0.49	7	
						0.48	10	
						< 0.01	3	
					peas w/o pods	< 0.01	7	
						< 0.01	10	

R157836 = epimer of lambda-cyhalothrin

a before last treatment

Table 73 Lambda-cyhalothrin residues in soya beans (immature) following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Thailand, Saraburi Province	CS 2.5	4	0.012	0.0025	whole pod with immature seeds	0.42	0	CYHA-VS-01,
						0.36	1	
						0.12	3	Bungearn, 2001
2001						0.29	5	
(OCB VP541)						0.07	8	
Thailand, Saraburi Province	CS 2.5	4	0.012	0.0025	whole pod with immature seeds	0.11	0	CYHA-VS-02,
						0.17	1	
						0.09	3	Bungearn, 2002
2002						0.14	5	
(OCB VP541)						0.08	8	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Thailand, Saraburi Province	CS 2.5	4	0.015	0.0025	whole pod with immature seeds	0.29	0	CYHA-VS-03,
						0.23	1	
						0.17	3	Lamai, 2004
2004						0.12	5	
(OCB VP541)						0.08	7	
						0.06	8	
Thailand, Saraburi Province	CS 2.5	4	0.016	0.0025	whole pod with immature seeds	0.23	0	CYHA-VS-04,
						0.17	1	
						0.09	3	Lamai, 2004
2004						0.07	5	
(OCB VP541)						0.06	7	
						0.05	8	

Table 74 Lambda-cyhalothrin residues in beans (pulses) following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.02	seeds, dry			RR97-016B
Conklin (MI)					l-cyhalothrin:	< 0.01	20	04-MI-96-506
						< 0.01	20	
1996					R157836:	< 0.01	20	Markle, 1997b
(Avanti)						< 0.01	20	
USA,	EC 12	4	0.034	0.02	seeds, dry			RR97-016B
Conklin (MI)					l-cyhalothrin:	< 0.01	20	04-MI-96-507
						< 0.01	20	
1996					R157836:	< 0.01	20	Markle, 1997b
(Sierra)						< 0.01	20	
USA,	EC 12	4	0.034	0.035	seeds, dry			RR97-016B
Northwood (ND)					l-cyhalothrin:	< 0.01	21	34-ND-96-508
						< 0.01	21	
1996					R157836:	< 0.01	21	Markle, 1997b
(Norstar)						< 0.01	21	
USA,	EC 12	4	0.034	0.035	seeds, dry			RR97-016B
Brampton (ND)					l-cyhalothrin:	< 0.01	24	34-ND-96-509
						< 0.01	24	
1996					R157836:	< 0.01	24	Markle, 1997b
(Agri 1)						< 0.01	24	
USA,	EC 12	4	0.034	0.02	seeds, dry			RR97-016B
Madrid (NE)					l-cyhalothrin:	< 0.01	20	48-NE-96-510
						< 0.01	20	
1996					R157836:	< 0.01	20	Markle, 1997b
(Foxfire)						< 0.01	20	
USA,	EC 12	4	0.034	0.035	seeds, dry			RR97-016B
Johnstown (CO)					l-cyhalothrin:	< 0.01	19	48-CO-96-511
						< 0.01, < 0.01	19	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
1996						(< 0.01)		Markle, 1997b
(Bilz)					R157836:	< 0.01	19	
						< 0.01, < 0.01 (< 0.01)	19	
USA,	EC 12	4	0.034	0.035	seeds, dry			RR97-016B
Orchard City (CO)					l-cyhalothrin:	< 0.01	21	14-CO-96-512
						< 0.01	21	
1996					R157836:	< 0.01	21	Markle, 1997b
(Bill Z)						< 0.01	21	
USA,	EC 12	4	0.034	0.035	seeds, dry			RR97-016B
Visalia (CA)					l-cyhalothrin:	< 0.01	21	02-CA-96-513
						< 0.01	21	
1996					R157836:	< 0.01	21	Markle, 1997b
(Greencrop)						< 0.01	21	
USA,	EC 12	4	0.034	0.02	seeds, dry			RR97-016B
Minidoka (ID)					l-cyhalothrin:	< 0.01	20	16-ID-96-514
						< 0.01	20	
1996					R157836:	< 0.01	20	Markle, 1997b
(Pink Rosa)						< 0.01	20	

R157836 = epimer of lambda-cyhalothrin

Table 75 Lambda-cyhalothrin residues in peas (pulses) following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.035	seeds, dry			RR97-016B
Moscow (ID)					l-cyhalothrin:	< 0.01	21	15-ID-96-501
						< 0.01	21	
1996					R157836:	< 0.01	21	Markle, 1997b
(Columbia)						< 0.01	21	
USA,	EC 12	4	0.034	0.035	seeds, dry			RR97-016B
Genesee (ID)					l-cyhalothrin:	< 0.01	21	15-ID-96-502
						< 0.01, < 0.01 (< 0.01)	21	
1996					R157836:		21	Markle, 1997b
(Columbia)						< 0.01	21	
						< 0.01, < 0.01 (< 0.01)		
USA,	EC 12	4	0.034	0.02	seeds, dry			RR97-016B
Hermiston (OR)					l-cyhalothrin:	0.05	21	15-OR-96-503
						0.03	21	
1996					R157836:	0.01	21	Markle, 1997b
(Balero)						< 0.01	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.02	seeds, dry			RR97-016B
Moses Lake (WA)					l-cyhalothrin:	< 0.01	21	15-WA-96-504
						< 0.01	21	
1996					R157836:	< 0.01	21	Markle, 1997b
(Polar Lot #657071)						< 0.01	21	
USA,	EC 12	4	0.034	0.02	seeds, dry			RR97-016B
Walla Walla (WA)					l-cyhalothrin:	< 0.01	21	15-WA-96-505
						< 0.01	21	
1996					R157836:	< 0.01	21	Markle, 1997b
(Columbia)						< 0.01	21	

R157836 = epimer of lambda-cyhalothrin

Table 76 Lambda-cyhalothrin residues in soya beans following foliar application (ground)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	2	0.034	0.035	seeds, dry			TMU1490/B
Vicksburg (MS)					l-cyhalothrin:	< 0.01	27	US5-83-513
					R157836:	< 0.01	27	
1983								Fitzpatrick, 1984
(Centennial)								
USA,	EC 12	2	0.034	0.07	seeds, dry			TMU1490/B
Bosco (LA)					l-cyhalothrin:	< 0.01	27	36-LA-83-036
					R157836:	< 0.01	27	
1983								Fitzpatrick, 1984
(Bragg)								
USA,	EC 12	2	0.034	0.015	seeds, dry			TMU1490/B
Champaign (IL)					l-cyhalothrin:	< 0.01	28	US4-83-SE08
					R157836:	< 0.01	28	
1983								Fitzpatrick, 1984
(not reported)								
USA,	EC 12	2	0.034	0.035	seeds, dry			TMU1490/B
Gardy (AL)					l-cyhalothrin:	< 0.01	27	45-AL-83-072
					R157836:	< 0.01	27	
1983								Fitzpatrick, 1984
(Centennial)								
USA,	EC 12	2	0.034	0.02	seeds, dry			TMU1490/B
Cochran (GA)					l-cyhalothrin:	< 0.01	28	62-GA-83-017
					R157836:	< 0.01	28	
1983								Fitzpatrick, 1984
(Gasoy 17)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	2	0.034	0.02	seeds, dry			TMU1490/B
Smithville (MO)					l-cyhalothrin:	< 0.01	29	48-MO-83-077
					R157836:	< 0.01	29	
1983								Fitzpatrick, 1984
(not reported)								
USA,	EC 12	2	0.034	0.01	seeds, dry			TMU1490/B
Delmar (DE)					l-cyhalothrin:	< 0.01	51	44-DE-83-019
					R157836:	< 0.01	51	
1983								Fitzpatrick, 1984
(York)								
USA,	EC 12	2	0.034	0.035	seeds, dry			TMU1490/B
Scott (AR)					l-cyhalothrin:	< 0.01	64	06-AR-83-026
					R157836:	< 0.01	64	Fitzpatrick, 1984
1983								
(Lee 74)								
USA,	EC 12	2	0.034	0.07	seeds, dry			TMU1991/B
Butlerville (IN)					l-cyhalothrin:	< 0.01	28	39-IN-84-006
						< 0.01	61	
1984					R157836:	< 0.01	28	Fitzpatrick, 1986
(Essex)						< 0.01	61	
USA,	EC 12	2	0.034	0.02	seeds, dry			TMU1991/B
Goldsboro (NC)					l-cyhalothrin:	< 0.01	30	US-84-SE33
						< 0.01	61	
1984					R157836:	< 0.01	30	Fitzpatrick, 1986
(Gasoy)						< 0.01	61	
USA,	EC 12	2	0.034	0.025	seeds, dry			TMU1991/B
Sioux Falls (SD)					l-cyhalothrin:	< 0.01	28	64-SD-84-078
						< 0.01	60	
1984					R157836:	< 0.01	28	Fitzpatrick, 1986
(Hardin)						< 0.01	60	
USA,	EC 12	2	0.034	0.02	seeds, dry			TMU1991/B
McCallsburg (IA)					l-cyhalothrin:	< 0.01	32	52-IA-84-060
						< 0.01	60	
1984					R157836:	< 0.01	32	Fitzpatrick, 1986
(McCubbin Taylor)						< 0.01	60	
USA,	EC 12	2	0.034	0.015	seeds, dry			TMU1991/B
Seymour (IL)					l-cyhalothrin:	< 0.01	29	US-84-SE01
						< 0.01	62	
1984					R157836:	< 0.01	29	Fitzpatrick, 1986
(Merschman Cheyenne II))						< 0.01	62	
USA,	EC 12	2	0.034	0.01	seeds, dry			TMU1991/B
Earleville (MD)					l-cyhalothrin:	< 0.01	28	44-MD-84-002
						< 0.01	60	Fitzpatrick, 1986
1984					R157836:	< 0.01	28	
(Williams)						< 0.01	60	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	2	0.034	0.035	seeds, dry			TMU1991/B
Vicksburg (MS)					l-cyhalothrin:	< 0.01	65	US-85-SE14
						< 0.01	65	
1985					R157836:	< 0.01	65	Fitzpatrick, 1986
(Centennial)						< 0.01	65	
USA,	EC 12	2	0.17	0.17	seeds, dry			TMU1991/B
Vicksburg (MS)					l-cyhalothrin:	< 0.01	65	US-85-SE14
					R157836:	< 0.01	65	
1985								Fitzpatrick, 1986
(Centennial)								
USA,	EC 12	2	0.034	0.015	seeds, dry			TMU1991/B
Seymour (IL)					l-cyhalothrin:	< 0.01	43	US-85-SE17
						< 0.01	43	
1985						< 0.01	63	Fitzpatrick, 1986
(Amsoy 71)						< 0.01	63	
					R157836:	< 0.01	43	
						< 0.01	43	
						< 0.01	63	
						< 0.01	63	
USA,	EC 12	2	0.17	0.07	seeds, dry			TMU1991/B
Seymour (IL)					l-cyhalothrin:	< 0.01	43	US-85-SE17
						< 0.01	63	
1985					R157836:	< 0.01	43	Fitzpatrick, 1986
(Amsoy 71)						< 0.01	63	
USA,	EC 12	2	0.034	0.03	seeds, dry			TMU1991/B
Enterprise (AL)					l-cyhalothrin:	< 0.01	35	62-AL-85-064
					R157836:	< 0.01	35	
1985								Fitzpatrick, 1986
(Braxton)								
Mexico,	EC 7	2	0.035	0.01	seeds, dry			RJ1721B,
Chiapas					l-cyhalothrin:	< 0.01	25	MX99-93-P202
						< 0.01	25	
1993					R157836:	< 0.01	25	Ryan, 1994
(Hartz 9000)						< 0.01	25	
Mexico,	EC 7	2	0.035	0.01	seeds, dry			RJ1721B,
Sinaloa					l-cyhalothrin:	< 0.01	38	MX99-93-P707
						< 0.01	38	
1993					R157836:	< 0.01	38	Ryan, 1994
(Davis)						< 0.01	38	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	2	0.34	0.3	seeds, dry			RR91-048B,
Scott (AR)					l-cyhalothrin:	< 0.01	45	
					R157836:	< 0.01	45	McKay, 1991d
1988					Compound Ia:	< 0.01	45	
(Bedford)					Compound V:	< 0.01	45	
					seeds, dry (RAC)			
					l-cyhalothrin:	0.01	45	
					R157836:	< 0.01	45	
					Compound Ia:	< 0.01	45	
					Compound V:	< 0.01	45	
					hulls			
					l-cyhalothrin:	< 0.01	45	
					R157836:	< 0.01	45	
					Compound Ia:	< 0.01	45	
					Compound V:	< 0.01	45	
					meal			
					l-cyhalothrin:	< 0.01	45	
					R157836:	< 0.01	45	
					Compound Ia:	< 0.01	45	
					Compound V:	< 0.01	45	
					crude oil			
					l-cyhalothrin:	< 0.01	45	
					R157836:	< 0.01	45	
					Compound Ia:	< 0.01, < 0.01 (< 0.01)	45	
					Compound V:	< 0.01, < 0.01 (< 0.01)	45	
					refined oil			
					l-cyhalothrin:	< 0.01	45	
					R157836:	< 0.01	45	
					Compound Ia:	< 0.01	45	
					Compound V:	< 0.01	45	
					soapstock			
					l-cyhalothrin:	< 0.01	45	
					R157836:	< 0.01	45	
					Compound Ia:	0.04, 0.04 (0.04)	45	
					Compound V:	< 0.01, < 0.01 (< 0.01)	45	

R157836 = epimer of lambda-cyhalothrin

Table 77 Lambda-cyhalothrin residues in soya beans following foliar application (aerial)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	2	0.034	0.07	seeds, dry			TMU1991/B
Lewisville (AR)					l-cyhalothrin:	< 0.01	28	06-AR-84-025
						< 0.01	60	
1984					R157836:	< 0.01	28	Fitzpatrick, 1986
(Bragg)						< 0.01	60	
USA,	EC 12	2	0.034	0.1	seeds, dry			TMU1991/B
Palmetto (LA)					l-cyhalothrin:	< 0.01	31	36-LA-84-040
						< 0.01	62	
1984					R157836:	< 0.01	31	Fitzpatrick, 1986
(Centennial)						< 0.01	62	
USA,	EC 12	2	0.034	0.7	seeds, dry			TMU1991/B
Lamberton (MN)					l-cyhalothrin:	< 0.01	45	64-MN-85-063R
					R157836:	< 0.01	45	
1985								Fitzpatrick, 1986
(Pioneer 5462)								
USA,	EC 12	2	0.034	0.1	seeds, dry			TMU1991/B
Cochran (GA)					l-cyhalothrin:	< 0.01	44	83-GA-85-005R
					R157836:	< 0.01	44	
1985								Fitzpatrick, 1986
(Gasoy 17)								
USA,	EC 12	2	0.034	0.1	seeds, dry			TMU1991/B
Bondurant (IA)					l-cyhalothrin:	< 0.01	45	52-IA-85-062
1985					R157836:	< 0.01	45	
(not reported)								Fitzpatrick, 1986
USA,	EC 12	2	0.034	0.035	seeds, dry			TMU1991/B
Flowers (MS)					l-cyhalothrin:	< 0.01	46	US-85-SE02
					R157836:	< 0.01	46	
1985								Fitzpatrick, 1986
(Wilstar 500)								

R157836 = epimer of lambda-cyhalothrin

Table 78 Lambda-cyhalothrin residues in carrots following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Italy,	CS 10	2	0.025	0.003	roots	< 0.01	0[a]	AF/5843/SY,
Pontemaodino						< 0.01	0	AF/5843/SY/1
						< 0.01	3	
2001						< 0.01	7	Goodband, 2002f
(Napoli)						< 0.01	14	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Italy,	CS 10	2	0.025	0.003	roots	< 0.01	0[a]	AF/5843/SY,
Pontemaodino						< 0.01	0	AF/5843/SY/2
						< 0.01	3	
2001						< 0.01	7	Goodband, 2002f
(Napoli)						< 0.01	14	REPLICATE TO: AF/5843/SY/1
Spain,	CS 10	2	0.025	0.003	roots	< 0.01	0[a]	AF/5843/SY,
Rota						< 0.01	0	AF/5843/SY/3
						< 0.01	3	
2001						< 0.01	7	Goodband, 2002f
(Lunaz)						< 0.01	14	
Spain,	CS 10	2	0.025	0.003	roots	< 0.01	0[1]	AF/5843/SY,
Seville						< 0.01	0	AF/5843/SY/4
						< 0.01	3	
2001						< 0.01	7	Goodband, 2002f
(Nantes)						< 0.01	14	
France (South),	CS 10	2	0.025	0.003	roots	< 0.01	0[a]	RJ3446B,
St. Caprais						< 0.01	0	AF/6474/SY/1
						< 0.01	7	
2003								Osborne, 2004
(Maestro)								
France (South)	CS 10	2	0.025	0.003	roots	< 0.01	0[a]	RJ3446B,
Blagnac						< 0.01	0	AF/6474/SY/2
						< 0.01	7	
2003								Osborne, 2004
(Maestro)								
Italy,	CS 10	2	0.025	0.003	roots	< 0.01	0[a]	RJ3446B,
Pontemaodino						< 0.01	0	AF/6474/SY/3
						< 0.01	7	
2003								Osborne, 2004
(Premia)								

a before last treatment

Table 79 Lambda-cyhalothrin residues in potatoes following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South),	CS 10	2	0.025	0.004	tubers	< 0.01	0[a]	AF/5853/SY,
Saint-Sardos						< 0.01	0	AF/5853/SY/1
						< 0.01	3	
2001						< 0.01	7	Goodband, 2002e
(Mona Lisa)						< 0.01	14	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South)	CS 10	2	0.025	0.004	tubers	< 0.01	0[a]	AF/5853/SY,
Saint-Martial						< 0.01	0	AF/5853/SY/2
						< 0.01	3	
2001						< 0.01	7	Goodband, 2002e
(Mona Lisa)						< 0.01	14	
Italy,	CS 10	2	0.025	0.004	tubers	< 0.01	0[a]	AF/5853/SY,
Castel San Pietro						< 0.01	0	AF/5853/SY/3
						< 0.01	3	
2001						< 0.01	7	Goodband, 2002e
(Primura)						< 0.01	14	
Italy,	CS 10	2	0.025	0.004	tubers	< 0.01	0[a]	AF/5853/SY,
Castel Guelfo						< 0.01	0	AF/5853/SY/4
						< 0.01	3	
2001						< 0.01	7	Goodband, 2002e
(Almera)						< 0.01	14	
Spain,	CS 10	2	0.025	0.004	tubers	< 0.01	0[a]	RJ3445B
Coria del Rio						< 0.01	0	AF/6577/SY/1
						< 0.01	7	
2002						< 0.01	14	Osborne, 2003
(Atlantic)								
Spain,	CS 10	2	0.025	0.004	tubers	< 0.01	0[a]	RJ3445B
Aznalcazar						< 0.01	0	AF/6577/SY/2
						< 0.01	7	
2002						< 0.01	14	Osborne, 2003
(Marfona)								
France (South),	CS 10	2	0.025	0.004	tubers	< 0.01	0[a]	RJ3445B
Bourret						< 0.01	0	AF/6577/SY/3
2002						< 0.01	7	
(Agatha)						< 0.01	14	Osborne, 2003
France (South),	CS 10	2	0.025	0.004	tubers	< 0.01	0[a]	RJ3445B
Castelsarasin						< 0.01	0	AF/6577/SY/4
						< 0.01	7	
2002						< 0.01	14	Osborne, 2003
(Mona Lisa)								

a before last treatment

Table 80 Lambda-cyhalothrin residues in asparagus (green) following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Thailand, Nakornpatom Province 2004 (Green asparagus VS 621)	CS 2.5	4	0.0125	0.0025	sticks	0.06	0	CYHA-AS-01, Chawengsri, 2004
						0.02	1	
						0.01	3	
						< 0.01	5	
						0.01	7	
Thailand, Kanchanaburi Province 2004 (Green asparagus VS 621)	CS 2.5	4	0.021	0.0025	sticks	0.05	0	CYHA-AS-02, Chawengsri, 2004
						0.01	1	
						0.01	3	
						< 0.01	5	
						< 0.01	7	
Thailand, Raschaburi Province 2005 (Green asparagus VS 621)	CS 2.5	4	0.022	0.0025	sticks	0.02	0	CYHA-AS-03, Chawengsri, 2005
						0.01	1	
						0.01	3	
						< 0.01	5	
						< 0.01	7	
Thailand, Kanchanaburi Province 2005 (Green asparagus VS 621)	CS 2.5	4	0.015	0.0025	sticks	0.09	0	CYHA-AS-04, Chawengsri, 2005
						0.05	1	
						0.01	3	
						< 0.01	5	
						< 0.01	7	
Thailand, Supunburi Province 2005 (Green asparagus VS 621)	CS 2.5	4	0.021	0.0025	sticks	0.24	0	CYHA-AS-05, Chawengsri, 2005
						0.1	1	
						0.01	3	
						< 0.01	5	
						< 0.01	7	
Thailand, Raschanaburi Province 2006 (Green asparagus VS 621)	CS 2.5	4	0.022	0.0025	sticks	0.03	0	CYHA-AS-06, Chawengsri, 2006
						0.02	1	
						0.01	3	
						< 0.01	5	
						< 0.01	7	

Table 81 Lambda-cyhalothrin residues in leek following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
United Kingdom, Birlingham 1998 (Prelina)	EC 5	2	0.01	0.0013	plant	0.01	0[a]	AK/4142/ZE
						0.08	0	AK/4142/ZE/1
						0.08	1	
						0.08	3	Harrison, 1999
						0.04	7	
						0.03	10	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
United Kingdom, Shepshed	EC 5	2	0.01	0.0025	plant	0.06	0[a]	AK/4142/ZE
						0.19	0	AK/4142/ZE/2
						0.14	1	
1998						0.19	3	Harrison, 1999
(Prenora)						0.11	7	
						0.12	10	
France (North), Varennes	EC 5	2	0.01	0.0025	plant	0.03	0[a]	AK/4142/ZE
						0.09	0	AK/4142/ZE/3
						0.1	1	
1998						0.09	3	Harrison, 1999
(Astor)						0.05	7	
						0.04	10	
France (North), Martot	EC 5	2	0.01	0.001	plant	0.01	0[a]	AK/4142/ZE
						0.07	0	AK/4142/ZE/4
						0.06	1	
1998						0.05	3	Harrison, 1999
(Kristina)						0.03	7	
						0.05	10	
United Kingdom, Strensham	CS 10	2	0.01	0.0011	plant	0.1	7	20085, Old, 2001c
2000 (Pandora)								
United Kingdom, Shepshed	CS 10	2	0.01	0.0011	plant	0.1	7	20085, Old, 2001c
2000 (Pandora)								
France (North), St. Hilaire St. Mesmin	CS 10	2	0.01	0.0011	plant	0.02	7	20085, Old, 2001c
2000 (Siegried)								
France (North), St. Georges-sur-Baulche	CS 10	2	0.01	0.0011	plant	0.05	7	20085, Old, 2001c
2000 (Poriblue)								

a before last treatment

Table 82 Lambda-cyhalothrin residues in barley grain following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South), Renneville 1998 (Nevada)	EC 5	2	0.01	0.005	grain	0.05	21	17915 AF/4150/IV/1 Old, 1999d
France (South) Aucamville 1998 (Kelibia)	EC 5	2	0.01	0.005	grain	0.03	21	17915 AF/4150/IV/2 Old, 1999d
Spain, Villanueva de los Infantes 1998 (Caballar)	EC 5	2	0.01	0.005	grain	0.07	14	17915 AF/4150/IV/3 Old, 1999d
Spain, El Bonillo 1998 (Cervecera)	EC 5	2	0.01	0.005	grain	0.05	14	17915 AF/4150/IV/4 Old, 1999d
France (South), Renneville 1998 (Nevada)	EC 5	2	0.02	0.01	grain	0.05	21	17915 AF/4150/IV/1 Old, 1999d
France (South) Aucamville 1998 (Kelibia)	EC 5	2	0.02	0.01	grain	0.08	21	17915 AF/4150/IV/2 Old, 1999d
Spain, Villanueva de los Infantes 1998 (Caballar)	EC 5	2	0.02	0.01	grain	0.16	14	17915 AF/4150/IV/3 Old, 1999d
Spain, El Bonillo 1998 (Cervecera)	EC 5	2	0.02	0.01	grain	0.12	14	17915 AF/4150/IV/4 Old, 1999d

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South), Aucamville	EC 5	2	0.01	0.003	grain	0.05 0.04	14 21	AF74727/ZE, AF74727/ZE/1
1999 (Keliba)								Brereton, 2000b
France (South), Grazac	EC 5	2	0.01	0.003	grain	0.04 0.02	14 35	AF74727/ZE, AF74727/ZE/2
1999 (Gaelic)								Brereton, 2000b
Italy, Conselice	EC 5	2	0.01	0.003	grain	0.05	10	AF74727/ZE, AF74727/ZE/3
1999 (Sonora)								Brereton, 2000b
Italy, Crevalcore	EC 5	2	0.01	0.003	grain	0.1	9	AF74727/ZE, AF74727/ZE/4
1999 (Federal)								Brereton, 2000b
France (South), Aucamville	EC 5	2	0.02	0.007	grain	0.09 0.07	14 21	AF74727/ZE, AF74727/ZE/1
1999 (Keliba)								Brereton, 2000b
France (South), Grazac	EC 5	2	0.02	0.007	grain	0.04 0.04	14 35	AF74727/ZE, AF74727/ZE/2
1999 (Gaelic)								Brereton, 2000b
Italy, Conselice	EC 5	2	0.02	0.007	grain	0.06	10	AF74727/ZE, AF74727/ZE/3
1999 (Sonora)								Brereton, 2000b
Italy, Crevalcore	EC 5	2	0.02	0.007	grain	0.12	9	AF74727/ZE, AF74727/ZE/4
1999 (Federal)								Brereton, 2000b
France (South), Montbrillais	CS 10	2	0.01	0.003	grain	0.03 0.04	25 32	AF/7308/SY, AF/7308/SY/1
2003 (Majestic)								Oxspring, 2004a

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South), Castelnau-d'Estretefonds	CS 10	2	0.01	0.003	grain	0.01 0.02	17 25	AF/7308/SY, AF/7308/SY/2
2003 (Nevada)								Oxspring, 2004a
Italy, Quatro Inferiore	CS 10	2	0.01	0.003	grain	0.03 0.01	21 28	AF/7308/SY, AF/7308/SY/3
2003 (Federal)								Oxspring, 2004a
Italy, Castenaso	CS 10	2	0.01	0.003	grain	0.03 0.01	21 28	AF/7308/SY, AF/7308/SY/4
2003 (Nikel)								Oxspring, 2004a
France (South), Montbrillais	CS 10	2	0.02	0.007	grain	0.08 0.05	25 32	AF/7308/SY, AF/7308/SY/1
2003 (Majestic)								Oxspring, 2004a
France (South), Castelnau-d'Estretefonds	CS 10	2	0.02	0.007	grain	0.02 0.06	17 25	AF/7308/SY, AF/7308/SY/2
2003 (Nevada)								Oxspring, 2004a
Italy, Quatro Inferiore	CS 10	2	0.02	0.007	grain	0.07 0.04	21 28	AF/7308/SY, AF/7308/SY/3
2003 (Federal)								Oxspring, 2004a
Italy, Castenaso	CS 10	2	0.02	0.007	grain	0.07 0.02	21 28	AF/7308/SY, AF/7308/SY/4
2003 (Nikel)								Oxspring, 2004a
France (South), St. Benigne	CS 10	2	0.01	0.003	grain	0.01	32	AF/8672/SY, AF/8672/SY/1 Plot 2 (Reverse decline study)
2005 (Verticale)								North, 2006f

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South), St. Benigne 2005 (Verticale)	CS 10	2	0.01	0.003	grain	0.03	30	AF/8672/SY, AF/8672/SY/1 Plot 3 (Reverse decline study) North, 2006f
France (South), St. Benigne 2005 (Verticale)	CS 10	2	0.01	0.003	grain	0.03	24	AF/8672/SY, AF/8672/SY/1 Plot 4 (Reverse decline study) North, 2006f
France (South), St. Benigne 2005 (Verticale)	CS 10	2	0.01	0.003	grain	0.04	20	AF/8672/SY, AF/8672/SY/1 Plot 5 (Reverse decline study) North, 2006f
France (South), St. Benigne 2005 (Verticale)	CS 10	2	0.01	0.003	grain	0.04	16	AF/8672/SY, AF/8672/SY/1 Plot 6 (Reverse decline study) North, 2006f
France (South), St. Benigne 2005 (Verticale)	CS 10	2	0.01	0.003	grain	0.04 0.02	28 35	AF/8672/SY, AF/8672/SY/1 Plot 7 (Reverse decline study) North, 2006f
Spain, Calatorao 2005 (Sultane)	CS 10	2	0.01	0.003	grain	< 0.01	45	AF/8672/SY, AF/8672/SY/2 Plot 2 (Reverse decline study) North, 2006f
Spain, Calatorao 2005 (Sultane)	CS 10	2	0.01	0.003	grain	< 0.01	42	AF/8672/SY, AF/8672/SY/2 Plot 3 (Reverse decline study) North, 2006f
Spain, Calatorao 2005 (Sultane)	CS 10	2	0.01	0.003	grain	< 0.01	38	AF/8672/SY, AF/8672/SY/2 Plot 4 (Reverse decline study) North, 2006f

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain, Calatorao 2005 (Sultane)	CS 10	2	0.01	0.003	grain	0.01	35	AF/8672/SY, AF/8672/SY/2 Plot 5 (Reverse decline study) North, 2006f
Spain, Calatorao 2005 (Sultane)	CS 10	2	0.01	0.003	grain	0.01	32	AF/8672/SY, AF/8672/SY/2 Plot 6 (Reverse decline study) North, 2006f
Spain, Calatorao 2005 (Sultane)	CS 10	2	0.01	0.003	grain	0.02 0.01	28 35	AF/8672/SY, AF/8672/SY/2 Plot 7 (Reverse decline study) North, 2006f
Spain, Villarreal de Huerva 2005 (Montage)	CS 10	2	0.01	0.003	grain	< 0.01	38	AF/8672/SY, AF/8672/SY/3 Plot 2 (Reverse decline study) North, 2006f
Spain, Villarreal de Huerva 2005 (Montage)	CS 10	2	0.01	0.003	grain	< 0.01	38	AF/8672/SY, AF/8672/SY/3 Plot 3 (Reverse decline study) North, 2006f
Spain, Villarreal de Huerva 2005 (Montage)	CS 10	2	0.01	0.003	grain	0.01	35	AF/8672/SY, AF/8672/SY/3 Plot 4 (Reverse decline study) North, 2006f
Spain, Villarreal de Huerva 2005 (Montage)	CS 10	2	0.01	0.003	grain	0.01	32	AF/8672/SY, AF/8672/SY/3 Plot 5 (Reverse decline study) North, 2006f
Spain, Villarreal de Huerva 2005 (Montage)	CS 10	2	0.01	0.003	grain	0.02	28	AF/8672/SY, AF/8672/SY/3 Plot 6 (Reverse decline study) North, 2006f

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain, Villarreal de Huerva 2005 (Montage)	CS 10	2	0.01	0.003	grain	0.03 0.02	28 35	AF/8672/SY, AF/8672/SY/3 Plot 7 (Reverse decline study) North, 2006f
Italy, Quarto Inferiore 2005 (Siberia)	CS 10	2	0.01	0.003	grain	0.06	35	AF/8672/SY, AF/8672/SY/4 Plot 2 (Reverse decline study) North, 2006f
Italy, Quarto Inferiore 2005 (Siberia)	CS 10	2	0.01	0.003	grain	0.04	28	AF/8672/SY, AF/8672/SY/4 Plot 3 (Reverse decline study) North, 2006f
Italy, Quarto Inferiore 2005 (Siberia)	CS 10	2	0.01	0.003	grain	0.07	24	AF/8672/SY, AF/8672/SY/4 Plot 4 (Reverse decline study) North, 2006f
Italy, Quarto Inferiore 2005 (Siberia)	CS 10	2	0.01	0.003	grain	0.08	22	AF/8672/SY, AF/8672/SY/4 Plot 5 (Reverse decline study) North, 2006f
Italy, Quarto Inferiore 2005 (Siberia)	CS 10	2	0.01	0.003	grain	0.06	15	AF/8672/SY, AF/8672/SY/4 Plot 6 (Reverse decline study) North, 2006f
Italy, Quarto Inferiore 2005 (Siberia)	CS 10	2	0.01	0.003	grain	0.33 0.02	29 35	AF/8672/SY, AF/8672/SY/4 Plot 7 (Reverse decline study) North, 2006f
Germany, Ratzeburg 1984 (Tapir)	EC 5	3	0.01	0.0025	grain	0.02	48	M4011B, RS 8416 B1 Sapiets, 1985d

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Lueneburg	EC 5	3	0.01	0.0025	grain	0.02 < 0.01 < 0.01	33 47 62	M4011B, RS 8417 B2
1984 (Cerise)								Sapiets, 1985d
Germany, Offenbach	EC 5	3	0.01	0.0025	grain	< 0.01 < 0.01 < 0.01	43 49 52	M4011B, RS 8417 E1
1984 (Trumpf)								Sapiets, 1985d
Germany, Lauenburg	EC 5	3	0.01	0.0025	grain	0.01 0.01 < 0.01	44 54 61	M4146B, RS 8517 B2
1985 (Mammut)								Ruskin, 1986
Germany, Celle	EC 5	3	0.01	0.0025	grain	0.01 < 0.01 < 0.01	30 42 60	M4146B, RS 8517 B4
1985 (Harry)								Ruskin, 1986
Germany, Dabrun-Melzwig	EC 5	3	0.01	0.0025	grain	< 0.01	34	RJ1464B, RS-9211-I1
1992 (Nixe)								Ryan, 1993
Germany, Dabrun-Melzwig	WG 5	3	0.01	0.0025	grain	< 0.01	34	RJ1464B, RS-9211-I1
1992 (Nixe)								Ryan, 1993
Germany, Rade	WG 2	3	0.005	0.001	grain	< 0.01	35	RJ1818B, RS-9430-K1
1994 (Teo)								Robinson, 1995
Germany, Rade	WG 5	3	0.0075	0.002	grain	< 0.01	35	RJ1818B, RS-9430-K1
1994 (Teo)								Robinson, 1995

Table 83 Lambda-cyhalothrin residues in maize grain following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034		grain			RR90-428B
W.Liberty (IA)					l-cyhalothrin:	< 0.01	21	36-IA-88-689
					R157836:	< 0.01	21	
1988					Compound Ia:	< 0.01	21	McKay, 1991
(Pioneer 3471)					Compound V:	< 0.01	21	
USA,	WG 12	4	0.034		grain			RR90-428B
W.Liberty (IA)					l-cyhalothrin:	< 0.01	21	36-IA-88-689
					R157836:	< 0.01	21	
1988								McKay, 1991
(Pioneer 3471)								
USA,	WG 12	4	0.034		grain			RR90-428B
Gallen (MI)					l-cyhalothrin:	< 0.01	22	28-MI-88-690
					R157836:	< 0.01	22	
1988								McKay, 1991
(Jacques 7770)								
USA,	EC 12	4	0.034		grain			RR90-428B
Mulkeytown (IL)					l-cyhalothrin:	< 0.01	21	22-IL-88-691
					R157836:	< 0.01	21	
1988					Compound Ia:	< 0.01	21	McKay, 1991
(Super Crost 5460)					Compound V:	< 0.01	21	
USA,	WG 12	4	0.034		grain			RR90-428B
Mulkeytown (IL)					l-cyhalothrin:	< 0.01	21	22-IL-88-691
					R157836:	< 0.01	21	
1988								McKay, 1991
(Super Crost 5460)								
USA,	EC 12	4	0.034		grain			RR90-428B
Owatonna (MN)					l-cyhalothrin:	< 0.01	21	30-MN-88-692
					R157836:	< 0.01	21	
1988					Compound Ia:	< 0.01	21	McKay, 1991
(Hubert Anderson A-95)					Compound V:	< 0.01	21	
USA,	WG 12	4	0.034		grain			RR90-428B
Owatonna (MN)					l-cyhalothrin:	< 0.01	21	30-MN-88-692
					R157836:	< 0.01	21	
1988								McKay, 1991
(Hubert Anderson A-95)								
USA,	WG 12	4	0.034		grain			RR90-428B
Chariton (MO)					l-cyhalothrin:	< 0.01	21	40-MO-88-693
1988					R157836:	< 0.01	21	McKay, 1991
(Epley 444e)								
USA,	EC 12	4	0.034		grain			RR90-428B
Kearney (NE)					l-cyhalothrin:	< 0.01	25	41-NE-88-694
					R157836:	< 0.01	25	
1988					Compound Ia:	< 0.01	25	McKay, 1991

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
(Northrup King 5940)					Compound V:	< 0.01	25	
USA,	WG	4	0.034		grain			RR90-428B
Kearney (NE)	12				l-cyhalothrin:	< 0.01	25	41-NE-88-694
					R157836:	< 0.01	25	
1988					Compound Ia:			McKay, 1991
(Northrup King 5940)					Compound V:			
USA,	EC 12	4	0.034		grain			RR90-428B
Martinsville (IN)					l-cyhalothrin:	< 0.01	39	24-IN-88-695
					R157836:	< 0.01	39	
1988					Compound Ia:	< 0.01	39	McKay, 1991
(Agrigold A6611)					Compound V:	< 0.01	39	
USA,	WG	4	0.034		grain			RR90-428B
Martinsville (IN)	12				l-cyhalothrin:	< 0.01	39	24-IN-88-695
					R157836:	< 0.01	39	
1988					Compound Ia:			McKay, 1991
(Agrigold A6611)					Compound V:			
USA,	WG	4	0.034		grain			RR90-428B
Wooster (OH)	12				l-cyhalothrin:	< 0.01	21	27-OH-88-696
					R157836:	< 0.01	21	
1988								McKay, 1991
(not reported)								
USA,	EC 12	4	0.034		grain			RR90-428B
Waterloo (WI)					l-cyhalothrin:	< 0.01	21	32-WI-88-697
					R157836:	< 0.01	21	
1988					Compound Ia:	< 0.01	21	McKay, 1991
(PX9353)					Compound V:	< 0.01	21	
USA,	WG	4	0.034		grain			RR90-428B
Waterloo (WI)	12				l-cyhalothrin:	< 0.01	21	32-WI-88-697
					R157836:	< 0.01	21	
1988					Compound Ia:			McKay, 1991
(PX9353)					Compound V:			
USA,	WG	4	0.034		grain			RR90-428B
Sioux Falls (SD)	12				l-cyhalothrin:	< 0.01, < 0.01 (0.01)	21	31-SD-88-698
1988					R157836:	< 0.01, < 0.01 (< 0.01)	21	McKay, 1991
(not reported)								
USA,	WG	4	0.034		grain			RR90-428B
Goldsboro (NC)	12				l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	20	47-NC-88-699
1988					R157836:	< 0.01, < 0.01 (< 0.01)	20	McKay, 1991
(Pioneer 3165)								
USA,	EC 12	4	0.034		grain			RR90-428B
Goldsboro (NC)					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	21	47-NC-88-702
1988					R157836:	< 0.01, < 0.01 (< 0.01)	21	McKay, 1991
(Pioneer 3165)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
					Compound Ia:	< 0.01	21	
					Compound V:	< 0.01	21	
USA,	EC 12	4	0.034		grain			RR90-428B
W. Des Moines (IA)					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	21	35-IA-88-703
1988					R157836:	< 0.01, < 0.01 (< 0.01)	21	McKay, 1991
(Pioneer 3475)					Compound Ia:	< 0.01	21	
					Compound V:	< 0.01	21	
USA,	WG 12	4	0.034		grain			RR90-428B
Wood River (NE)					l-cyhalothrin:	< 0.01	24	38-NE-88-704
					R157836:	< 0.01	24	
1988								McKay, 1991
(Keltgen 2750)								
USA,	WG 12	4	0.034		grain			RR90-428B
Geneseo (IL)					l-cyhalothrin:	< 0.01	19	26-IL-88-705
					R157836:	< 0.01	19	
1988								McKay, 1991
(Pioneer 3475)								

R157836 = epimer of lambda-cyhalothrin

Table 84 Lambda-cyhalothrin residues in oats grain following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany,	EC 5	3	0.01	0.0025	grain	< 0.01	31	M4011B,
Wernersberg						< 0.01	56	RS 8417 E2
						< 0.01	65	
1984								Sapiets, 1985d
(Alfred)								
Germany,	EC 5	3	0.01	0.0025	grain	0.04	14	M4146B,
Wernersberg						0.02	28	RS 8516 E1
						< 0.01	36	
1985						< 0.01	44	Ruskin, 1986
(Cambo)								
Germany,	EC 5	3	0.01	0.0025	grain	< 0.01	36	RJ1464B,
Ziethen								RS-9211-B1
1992								Ryan, 1993
(Alfred)								
Germany,	WG 5	3	0.01	0.0025	grain	< 0.01	36	RJ1464B,
Ziethen								RS-9211-B1
1992								Ryan, 1993
(Alfred)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Gehmen	WG 2	3	0.005	0.001	grain	< 0.01	35	RJ1818B, RS-9430-K2
1994 (Salomon)								Robinson, 1995
Germany, Gehmen	WG 5	3	0.0075	0.002	grain	< 0.01	35	RJ1818B, RS-9430-K2
1994 (Salomon)								Robinson, 1995

Table 85 Lambda-cyhalothrin residues in rye grain following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Ratzeburg	EC 5	3	0.01	0.0025	grain	< 0.01 < 0.01 < 0.01	68 74 84	M4011B, RS 8417 B1
1984 (Halo)								Sapiets, 1985d
Germany, Ratzeburg 1985 (Pekuro)	EC 5	3	0.01	0.0025	grain	< 0.01 < 0.01 < 0.01	69 80 88	M4146B, RS 8517 B1 Ruskin, 1986
Germany, Varendorf	WG 2	3	0.005	0.001	grain	< 0.01	41	RJ1818B, RS-9430-B1
1994 (Marder)								Robinson, 1995
Germany, Varendorf	WG 5	3	0.0075	0.002	grain	0.01	41	RJ1818B, RS-9430-B1
1994 (Marder)								Robinson, 1995

Table 86 Lambda-cyhalothrin residues in triticale grain following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Inchenhofen	WG 2	3	0.005	0.001	grain	< 0.01 < 0.01	33 38	RJ1818B, RS-9430-G1
1994 (Modus)								Robinson, 1995

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Inchenhofen	WG 5	3	0.0075	0.002	grain	< 0.01	33	RJ1818B,
						< 0.01	38	RS-9430-G1
1994 (Modus)								Robinson, 1995

Table 87 Lambda-cyhalothrin residues in wheat grain following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA, Limon Co (CO)	WG 12	2	0.034		grain			RR91-011B
					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)< 0.01	30	39-CO-88-654
							40	
1988 (not reported)					R157836:	< 0.01, < 0.01 (< 0.01)< 0.01	30	Francis, 1991
							40	
					Compound Ia:	< 0.01	30	
					Compound V:	< 0.01	30	
USA, Yoder (WY)	WG 12	2	0.034		grain			RR91-011B
					l-cyhalothrin:	< 0.01	30	41-WY-88-655
						< 0.01	45	
1998 (Cheyenne)					R157836:	< 0.01	30	Francis, 1991
						< 0.01	45	
USA, Rulton (KS)	WG 12	2	0.034		grain			RR91-011B
					l-cyhalothrin:	< 0.01	30	39-KS-88-656
						< 0.01	45	
1988 (Hawk)					R157836:	< 0.01	30	Francis, 1991
						< 0.01	45	
					Compound Ia:	< 0.01	30	
					Compound V:	< 0.01	30	
USA, Kearney (NE)	WG 12	2	0.034		grain			RR91-011B
					l-cyhalothrin:	0.02	30	41-NE-88-657
						< 0.01	41	
1988 (Cody)					R157836:	< 0.01	30	Francis, 1991
						< 0.01	41	
					Compound Ia:	< 0.01	30	
					Compound V:	< 0.01	30	
USA, Bloomfield (MT)	WG 12	2	0.034		grain			RR91-011B
					l-cyhalothrin:	< 0.01	31	34-MR-88-658
						< 0.01	44	
1988 (Olat)					R157836:	< 0.01	31	Francis, 1991
						< 0.01	44	
					Compound Ia:	< 0.01, < 0.01 (< 0.01)	31	
					Compound V:	< 0.01, < 0.01 (< 0.01)	31	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	WG	2	0.034		grain			RR91-011B
Yuma (AZ)	12				l-cyhalothrin:	< 0.01	30	14-AZ-88-660
						0.01	45	
1988					R157836:	< 0.01	30	Francis, 1991
(Yecora Rojo)						< 0.01	45	
USA,	EC 12	2	0.034		grain			RR91-011B
Yuma (AZ)					l-cyhalothrin:	0.01	30	14-AZ-88-660
						< 0.01	45	
1988					R157836:	< 0.01	30	Francis, 1991
(Yecora Rojo)						< 0.01	45	
					Compound Ia:	< 0.01	30	
					Compound V:	< 0.01	30	
USA,	WG	2	0.034		grain			RR91-011B
Chico (CA)	12				l-cyhalothrin:	0.02, 0.01 (0.02)	20	20-CA-88-663
						< 0.01	34	
1988					R157836:	< 0.01, < 0.01 (< 0.01)	20	Francis, 1991
(Yolo)							3	
						< 0.01	4	
USA,	WG	2	0.034		grain			RR91-011B
Stockton (CA)	12				l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	30	17-CA-88-664
1988					R157836:	< 0.01	44	Francis, 1991
(Yecora Rojo)						< 0.01, < 0.01 (< 0.01)	30	
						< 0.01	44	
USA,	EC 12	2	0.034		grain			RR91-011B
Stockton (CA)					l-cyhalothrin:	< 0.01	30	17-CA-88-664
						< 0.01	44	
1988					R157836:	< 0.01	30	Francis, 1991
(Yecora Rojo)						< 0.01	44	
					Compound Ia:	< 0.01	30	
					Compound V:	< 0.01	30	
USA,	WG	2	0.034		grain			RR91-011B
Enterprise (AL)	12				l-cyhalothrin:	0.03	29	44-AL-88-665
						< 0.01	44	
1988					R157836:	< 0.01	29	Francis, 1991
(Florida 302)						< 0.01	44	
					Compound Ia:	< 0.01	29	
					Compound V:	< 0.01	29	
USA,	EC 12	2	0.034		grain			RR91-011B
Enterprise (AL)					l-cyhalothrin:	< 0.01	44	44-AL-88-665
					R157836:	< 0.01	44	
1988								Francis, 1991
(Florida 302)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	WG	2	0.034		grain			RR91-011B
Pullman (WA)	12				l-cyhalothrin:	< 0.01	34	15-WA-88-666
						< 0.01	47	
1988					R157836:	< 0.01	34	Francis, 1991
(Hill 81 Soft White)						< 0.01	47	
USA,	EC 12	2	0.034		grain			RR91-011B
Pullman (WA)					l-cyhalothrin:	< 0.01	34	15-WA-88-666
						< 0.01	47	
1988					R157836:	< 0.01	34	Francis, 1991
(Hill 81 Soft White)						< 0.01	47	
					Compound Ia:	< 0.01	34	
					Compound V:	< 0.01	34	
USA,	WG	2	0.034		grain			RR91-011B
Columbia (LA)	12				l-cyhalothrin:	< 0.01	27	51-LA-88-667
						< 0.01, < 0.01 (< 0.01)	45	
1988								Francis, 1991
(Florida 302)					R157836:	< 0.01	27	
						< 0.01, < 0.01 (< 0.01)	45	
USA,	EC 12	2	0.034		grain			RR91-011B
Columbia (LA)					l-cyhalothrin:	< 0.01	30	51-LA-88-667
						< 0.01	45	
1988					R157836:	< 0.01	30	Francis, 1991
(Florida 302)						< 0.01	45	
USA,	WG	2	0.034		grain			RR91-011B
Heartland (IN)	12				l-cyhalothrin:	< 0.01	30	24-IN-88-668
						< 0.01, < 0.01 (< 0.01)	45	
1988								Francis, 1991
(Cladwell)					R157836:	< 0.01	30	
						< 0.01, < 0.01 (< 0.01)	45	
USA,	EC 12	2	0.034		grain			RR91-011B
Heartland (IN)					l-cyhalothrin:	< 0.01	30	24-IN-88-668
						< 0.01	45	
1988					R157836:	< 0.01	30	Francis, 1991
(Cladwell)						< 0.01	45	
USA,	WG	2	0.034		grain			RR91-011B
Yuma (AZ)	12				l-cyhalothrin:	< 0.01	30	14-AZ-88-669
						< 0.01	45	
1988					R157836:	< 0.01	30	Francis, 1991
(not reported)						< 0.01	45	
USA,	EC 12	2	0.034		grain			RR91-011B
Yuma (AZ)					l-cyhalothrin:	< 0.01	30	14-AZ-88-669
						< 0.01, < 0.01 (< 0.01)	45	
1988								Francis, 1991
(not reported)					R157836:	< 0.01	30	
						< 0.01, < 0.01 (< 0.01)	45	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	2	0.034		grain			RR91-011B
Paynesville (MN)					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	30	33-MN-89-671
1989					R157836:	< 0.01, < 0.01 (< 0.01)	30	Francis, 1991
(Marshall)					Compound Ia:	0.02, < 0.01 (0.02)	30	
					Compound V:	< 0.01, < 0.01 (< 0.01)	30	
USA,	EC 12	2	0.034		grain			RR91-011B
Jerome (ID)					l-cyhalothrin:	< 0.01	30	16-ID-89-672
					R157836:	< 0.01	30	
1989					Compound Ia:	< 0.01	30	Francis, 1991
(not reported)					Compound V:	< 0.01	30	
USA,	EC 12	2	0.034		grain			RR91-011B
Washbury (ND)					l-cyhalothrin:	< 0.01	30	34-ND-89-673
					R157836:	< 0.01	30	
1989					Compound Ia:	< 0.01	30	Francis, 1991
(Pioneer 2375)					Compound V:	< 0.01	30	
USA,	EC 12	2	0.034		grain			RR91-011B
Washbury (ND)					l-cyhalothrin:	< 0.01	30	34-ND-89-675
					R157836:	< 0.01	30	
1989					Compound Ia:	< 0.01, < 0.01 (< 0.01)	30	Francis, 1991
(Pioneer 2375)					Compound V:	< 0.01, < 0.01 (< 0.01)	30	
Germany,	EC 5	3	0.01	0.0025	grain	< 0.01	28	M4011B,
Bad Bergzabern						< 0.01	35	RS 8416 E1
						< 0.01	52	
1984								Sapiets, 1985d
(Turbo)								
Germany,	EC 5	3	0.01	0.0025	grain	< 0.01	51	M4011B,
Varendorf						< 0.01	67	RS 8417 E2
						< 0.01	73	
1984								Sapiets, 1985d
(Okapi)								
Germany,	EC 5	3	0.01	0.0025	grain	< 0.01	47	M4146B,
Moelln								RS 8516 B1
1985								Ruskin, 1986
(Kanzler)								
Germany,	EC 5	3	0.01	0.0025	grain	< 0.01	46	M4146B,
Kapellen-Drusweiler						< 0.01	60	RS 8517 B1
						< 0.01	67	
1985								Ruskin, 1986
(Grandur)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Varendorf	EC 5	3	0.01	0.0025	grain	0.01	30	M4146B,
						< 0.01	42	RS 8517 B1
						< 0.01	60	
1985 (Selpek)								Ruskin, 1986
Germany, Kapellen-Drusweiler	EC 5	3	0.01	0.0025	grain	< 0.01	42	RJ1464B, RS-9211-E1
1992 (Ambral)								Ryan, 1993
Germany, Kapellen-Drusweiler	WG 5	3	0.01	0.0025	grain	< 0.01	42	RJ1464B, RS-9211-E1
1992 (Ambral)								Ryan, 1993
Germany, Kleindroeben	EC 5	3	0.01	0.0025	grain	< 0.01	41	RJ1464B, RS-9211-I2
1992 (Borenos)								Ryan, 1993
Germany, Kleindroeben	WG 5	3	0.01	0.0025	grain	< 0.01	41	RJ1464B, RS-9211-I2
1992 (Borenos)								Ryan, 1993

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	2	0.17	0.2	grain			RR90-424B,
Wahburn (ND)					l-cyhalothrin:	0.02	30	34-ND-89-682
					R157836:	< 0.01	30	
1989					Compound Ia:	< 0.01	30	McKay 1991b
(Pioneer 2375)					Compound V:	0.01	30	
					bran			
					l-cyhalothrin:	0.09, 0.08 (0.09)	30	
					R157836:	0.01, 0.01 (0.01)	30	
					Compound Ia:	0.02, < 0.01 (0.02)	30	
					Compound V:	0.03, 0.01 (0.02)	30	
					middlings			
					l-cyhalothrin:	0.02	30	
					R157836:	< 0.01	30	
					Compound Ia:	< 0.01	30	
					Compound V:	0.01	30	
					shorts & germs			
					l-cyhalothrin:	0.03	30	
					R157836:	< 0.01	30	
					Compound Ia:	< 0.01	30	
					Compound V:	0.02	30	
					low grade flour			
					l-cyhalothrin:	0.01	30	
					R157836:	< 0.01	30	
					Compound Ia:	< 0.01	30	
					Compound V:	< 0.01	30	
					patend flour			
					l-cyhalothrin:	0.01	30	
					R157836:	< 0.01	30	
					Compound Ia:	< 0.01	30	
					Compound V:	< 0.01	30	
					grain dust (>2030 µ)			
					l-cyhalothrin:	0.8	30	
					R157836:	0.16	30	
					Compound Ia:	0.12, 0.14 (0.13)	30	
					Compound V:	0.14, 0.12 (0.13)	30	
					grain dust (<420 µ)			
					l-cyhalothrin:	2.0	30	
					R157836:	0.33	30	

R157836 = epimer of lambda-cyhalothrin

Table 88 Lambda-cyhalothrin residues in rice grain following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA, Shoffner (AR)	EC 12	4	0.045	0.005	grain			RR96-056B, 49-AR-95-281
					l-cyhalothrin:	0.46	21	
						0.47	21	
1995 (Kaybonnet)					R157836:	0.05	21	Roper, 1996
						0.06	21	
USA, Proctor (AR)	EC 12	4	0.045	0.003	grain			RR96-056B, 49-AR-95-282
					l-cyhalothrin:	0.56	21	
						0.79	21	
1995 (Newbonney)					R157836:	0.06	21	Roper, 1996
						0.09	21	
USA, Stuttgart (AR)	EC 12	4	0.045	0.005	grain			RR96-056B, 49-AR-95-283
				0.005	l-cyhalothrin:	0.42	20	
				0.004		0.37, 0.39 (0.38)	20	
1995 (Lemont)				0.004	R157836:	0.04	20	Roper, 1996
						0.04, 0.04 (0.04)	20	
USA, Keiser (AR)	EC 12	4	0.045	0.005	grain			RR96-056B, 49-AR-95-284
				0.004	l-cyhalothrin:	0.31	21	
				0.005		0.35	21	
1995 (Kaybonnet)				0.005	R157836:	0.03	21	Roper, 1996
						0.04	21	
USA, Lodge Corner (AR)	EC 12	4	0.045	0.005	grain			RR96-056B, 49-AR-95-285
				0.004	l-cyhalothrin:	0.24	21	
				0.005		0.19	21	
1995 (Lemont)				0.005	R157836:	0.02	21	Roper, 1996
						0.02	21	
USA, Georgetown (AR)	EC 12	4	0.045	0.005	grain			RR96-056B, 49-AR-95-286
					l-cyhalothrin:	0.26	21	
						0.29, 0.25 (0.27)	21	
1995 (Cypress)					R157836:	0.02	21	Roper, 1996
						0.03, 0.02 (0.03)	21	
USA, Rosa (AR)	EC 12	4	0.045	0.003	grain			RR96-056B, 69-LA-95-287
					l-cyhalothrin:	0.14	21	
						0.11	21	
1995 (Lemont)					R157836:	0.02	21	Roper, 1996
						0.01	21	
USA, Winnsboro (LA)	EC 12	4	0.045	0.003	grain			RR96-056B, 69-LA-95-288
				0.003	l-cyhalothrin:	0.16	21	
				0.005		0.2	21	
1995 (Cypress)				0.005	R157836:	0.02	21	Roper, 1996
						0.02	21	
USA, St. Joseph (LA)	EC 12	4	0.045	0.002	grain			RR96-056B, 69-LA-95-289
				0.003	l-cyhalothrin:	0.18	21	
				0.005		0.17, 0.2 (0.19)	21	
1995 (Cypress)				0.005	R157836:	0.02	21	Roper, 1996
						0.02, 0.03 (0.03)	21	
USA, Steele (MO)	EC 12	4	0.045	0.003	grain			RR96-056B, 50-MO-95-290
					l-cyhalothrin:	0.06	21	
						0.05	21	
1995 (Allen)					R157836:	< 0.01	21	Roper, 1996
						< 0.01	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.045	0.005	grain			RR96-056B,
Leland (MS)				0.003	l-cyhalothrin:	0.61	7	05-MS-95-291
				0.005		0.38	14	
1995				0.005		0.32	21	Roper, 1996
(Lamont)						0.19	28	
					R157836:	0.05	7	
						0.04	14	
						0.04	21	
						0.02	28	
USA,	EC 12	4	0.045	0.004	grain			RR96-056B,
Greenville (MS)				0.002	l-cyhalothrin:	0.18	21	71-MS-95-292
				0.005		0.2	21	
1995				0.005	R157836:	0.02	21	Roper, 1996
(Lemont)						0.03	21	
USA,	EC 12	4	0.045	0.003	grain			RR96-056B,
Pattison (TX)					l-cyhalothrin:	0.13	21	25-TX-95-293
						0.15	21	
1995					R157836:	0.01	21	Roper, 1996
(Cypress)						0.01	21	
USA,	EC 12	4	0.045	0.005	grain			RR96-056B,
Louise (TX)				0.004	l-cyhalothrin:	0.51	21	25-TX-95-294
				0.005		0.43	21	
1995				0.005	R157836:	0.06	21	Roper, 1996
(Cypress)						0.04	21	
USA,	EC 12	4	0.045	0.005	grain			RR96-056B,
Richvale (CA)					l-cyhalothrin:	0.51	21	17-CA-95-295
						0.66	21	
1995					R157836:	0.05	21	Roper, 1996
(M-202)						0.06	21	
USA,	EC 12	4	0.045	0.005	grain			RR96-056B,
Biggs (CA)					l-cyhalothrin:	0.72	7	17-CA-95-296
						0.61	14	
1995						0.48	21	Roper, 1996
(M-103)						0.39	28	
					R157836:	0.06	7	
						0.06	14	
						0.05	21	
						0.05	28	
USA,	EC 12	4	0.22	0.25	grain			RR96-055B,
Leland (MS)			0.22	0.13	l-cyhalothrin:	1.5	21	
			0.22	0.25	R157836:	0.17	21	Roper, 1996c
1995			0.22	0.25				
(Lemont)					grain (RAC)			
					l-cyhalothrin:	1.4	21	
					R157836:	0.16	21	
					polished rice			
					l-cyhalothrin:	< 0.01	21	
					R157836:	< 0.01	21	
					hulls			
					l-cyhalothrin:	8.5, 9.2 (8.9)	21	
					R157836:	0.89, 1.0 (0.95)	21	
					bran			
					l-cyhalothrin:	0.3	21	
					R157836:	0.04	21	

R157836 = epimer of lambda-cyhalothrin

Table 89 Lambda-cyhalothrin residues in sorghum grain following foliar application (ground)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.022	0.013	grain[a]			RR90-417B,
Desoto (KS)			0.022	0.013	l-cyhalothrin:	< 0.02	148	48-KS-87-635
					R157836:	< 0.02	148	
1987								Francis, 1991b
(Paymaster 1022)			0.022	0.013	grain[b]			
					l-cyhalothrin:	< 0.02	72	
					R157836:	< 0.02	72	
			0.022	0.013	grain[c]			
					l-cyhalothrin:	0.02	40	
					R157836:	< 0.02	40	
					Compound Ia:	< 0.01	40	
					Compound V:	< 0.01	40	
USA,	EC 12	4	0.022	0.013	grain[a]			RR90-417B,
Brookings (SD)			0.022	0.013	l-cyhalothrin:	< 0.02	84	64-SD-87-636
					R157836:	< 0.02	84	
1987								Francis, 1991b
(Sokota 910GS)			0.022	0.013	grain[b]			
					l-cyhalothrin:	< 0.02	52	
					R157836:	< 0.02	52	
			0.022	0.013	grain[c]			
					l-cyhalothrin:	0.18	30	
					R157836:	< 0.02	30	
					Compound Ia:	0.02	30	
					Compound V:	< 0.01	30	
USA,	EC 12	4	0.022	0.008	grain[a]			RR90-417B,
Waverly (NB)			0.022	0.008	l-cyhalothrin:	< 0.02	93	92-NB-87-637
					R157836:	< 0.02	93	
1987								Francis, 1991b
(NC + 172)			0.022	0.008	grain[b]			
					l-cyhalothrin:	< 0.02	58	
					R157836:	< 0.02	58	
			0.022	0.008	grain[c]			
					l-cyhalothrin:	0.05	36	
					R157836:	< 0.02	36	
					Compound Ia:	< 0.01	36	
					Compound V:	< 0.01	36	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.022	0.025	grain[a]			RR90-417B,
Statesboro (GA)			0.022	0.025	l-cyhalothrin:	< 0.02	93	83-GA-87-641
					R157836:	< 0.02	93	
1987								Francis, 1991b
(Dekalb 64)			0.022	0.025	grain[b]			
					l-cyhalothrin:	0.02	59	
					R157836:	< 0.02	59	
			0.022	0.025	grain[c]			
					l-cyhalothrin:	0.06	30	
					R157836:	< 0.02	30	
					Compound Ia:	< 0.01	30	
					Compound V:	< 0.01	30	
USA,	EC 12	4	0.022	0.013	grain[a]			RR90-417B,
Lewisville (AR)			0.022	0.013	l-cyhalothrin:	< 0.02, < 0.02 (< 0.02)	130	06-AR-87-647
					R157836:		130	
1987						< 0.02, < 0.02 (< 0.02)		Francis, 1991b
(not reported)			0.022	0.013	grain[b]			
					l-cyhalothrin:		44	
					R157836:		44	
						< 0.02		
			0.022	0.013	grain[c]	< 0.02		
					l-cyhalothrin:		30	
					R157836:		30	
					Compound Ia:	< 0.02	30	
					Compound V:	< 0.02	30	
						< 0.01		
						< 0.01		
USA,	EC 12	4	0.022	0.01	grain			RR90-417B,
Pikeville (NC)					l-cyhalothrin:	< 0.02, < 0.02 (< 0.02)	39	US01-87-643
					R157836:		39	
1987					Compound Ia:	< 0.02, < 0.02 (< 0.02)	39	Francis, 1991b
(NK 2660)					Compound V:		39	
						< 0.01		
						< 0.01		

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.022	0.01	grain			RR90-417B,
Pikeville (NC)			0.022	0.01	l-cyhalothrin:	0.08, 0.05 (0.07)	39	US01-87-643
			0.022	0.01		0.04, 0.05 (0.05)	39	
1987			0.22	0.1		0.07, 0.06 (0.07)	39	Francis, 1991b
(NK 2660)					R157836:	< 0.02, < 0.02 (< 0.02)	39	
							39	
					Compound Ia:	< 0.02, < 0.02 (< 0.02)	39	
							39	
						< 0.02, < 0.02 (< 0.02)	39	
					Compound V:	< 0.01, < 0.01 (< 0.01)	39	
							39	
						< 0.01, < 0.01 (< 0.01)	39	
						< 0.01, < 0.01 (< 0.01)		
						< 0.01, < 0.01 (< 0.01)		
						< 0.01, < 0.01 (< 0.01)		
						< 0.01, < 0.01 (< 0.01)		
USA,	EC 12	4	0.022	0.013	grain[a]			RR90-417B,
Seymour (IL)			0.022	0.013	l-cyhalothrin:	< 0.02	85	US04-87-658
					R157836:	< 0.02	85	
1987								Francis, 1991b
(not reported)			0.022	0.013	grain[b]			
					l-cyhalothrin:	< 0.02	51	
					R157836:	< 0.02	51	
			0.022	0.013	grain[c]			
					l-cyhalothrin:	0.02	29	
					R157836:	< 0.02	29	
					Compound Ia:	< 0.01	29	
					Compound V:	< 0.01	29	
USA,	EC 12	4	0.11	0.05	grain[a]			RR90-417B,
Seymour (IL)			0.11	0.05	l-cyhalothrin:	< 0.02	85	US04-87-658
					R157836:	< 0.02	85	
1987								Francis, 1991b
(not reported)			0.11	0.05	grain[b]			
					l-cyhalothrin:	< 0.02	51	
					R157836:	< 0.02	51	
			0.11	0.05	grain[c]			
					l-cyhalothrin:	0.14	29	
					R157836:	< 0.02	29	
					Compound Ia:	0.02	29	
					Compound V:	0.01	29	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.11	0.04	grain			RR90-426B,
Seymour (IL)					l-cyhalothrin:	0.06	30	US-04-87-658P
					R157836:	< 0.01	30	
1987					Compound Ia:	0.02	30	McKay 1991c
(Pioneer 8790)					Compound V:	0.04	30	
					flour			
					l-cyhalothrin:	0.06	30	
					R157836:	< 0.01	30	
					Compound Ia:	0.01	30	
					Compound V:	0.02	30	
					starch			
					l-cyhalothrin:	< 0.01	30	
					R157836:	< 0.01	30	
					Compound Ia:	< 0.01	30	
					Compound V:	< 0.01	30	
					dust			
					l-cyhalothrin:	0.42	30	
					R157836:	0.04	30	

a after second treatment
b after third treatment
c after fourth treatment
R157836 = epimer of lambda-cyhalothrin

Table 90 Lambda-cyhalothrin residues in sorghum grain following foliar application (aerial)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.022	0.1	grain[a]			RR90-417B,
Wathena (KS)			0.022	0.1	l-cyhalothrin:	< 0.02	91	48-KS-87-645
					R157836:	< 0.02	91	
1987								Francis, 1991b
(Pioneer 8358)			0.022	0.1	grain[b]			
					l-cyhalothrin:	< 0.02	59	
					R157836:	< 0.02	59	
			0.022	0.1	grain[c]			
					l-cyhalothrin:	0.05	30	
					R157836:	< 0.02	30	
					Compound Ia:	< 0.01	30	
					Compound V:	< 0.01	30	
USA,	EC 12	4	0.022	0.025	grain[a]			RR90-417B,
Proctor (AR)			0.022	0.025	l-cyhalothrin:	< 0.02	86	06-AR-87-642
					R157836:	< 0.02	86	
1987								Francis, 1991b
(Stauffer 530)			0.022	0.025	grain[b]			

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
					l-cyhalothrin:	< 0.02	50	
					R157836:	< 0.02	50	
			0.022	0.025	grain[c]			
					l-cyhalothrin:	0.02	36	
					R157836:	< 0.02	36	
					Compound Ia:	< 0.01	36	
					Compound V:	< 0.01	36	
USA,	EC 12	3	0.022	0.07	grain[a]			RR90-417B,
Farwell (TX)			0.022	0.07	l-cyhalothrin:	< 0.02	117	72-TX-87-644
					R157836:	< 0.02	117	
1987								Francis, 1991b
(Pioneer 8680)			0.022	0.07	grain[b]			
					l-cyhalothrin:	< 0.02	80	
					R157836:	< 0.02	80	

a after second treatment

b after third treatment

c after fourth treatment

R157836 = epimer of lambda-cyhalothrin

Table 91 Lambda-cyhalothrin residues in sorghum grain following furrow irrigation

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	3	0.022	0.01	grain[a]			RR90-417B,
Ft. Collins (CO)			0.022	0.01	l-cyhalothrin:	< 0.02	119	92-CO-87-634
					R157836:	< 0.02	119	
1987								Francis, 1991b
(Triumph)			0.022	0.01	grain[b]			
					l-cyhalothrin:	< 0.02	63	
					R157836:	< 0.02	63	
USA,	EC 12	4	0.022	0.01	grain[a]			RR90-417B,
Yuma (AZ)			0.022	0.01	l-cyhalothrin:	< 0.02	82	38-AZ-87-639
					R157836:	< 0.02	82	
1987								Francis, 1991b
(Funks G5 22DR Hybrid)			0.022	0.01	grain[b]			
					l-cyhalothrin:	< 0.02	56	
					R157836:	< 0.02	56	
			0.022	0.01	grain[c]			
					l-cyhalothrin:	0.04	31	
					R157836:	< 0.02	31	
					Compound Ia:	< 0.01	31	
					Compound V:	< 0.01	31	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.022	0.007	grain[a]			RR90-417B,
Visalia (CA)			0.022	0.007	l-cyhalothrin:	< 0.02	98	USO2-87-640
					R157836:	< 0.02	98	
1987								Francis, 1991b
(P.C. Seimer)			0.022	0.007	grain[b]			
					l-cyhalothrin:	< 0.02	56	
					R157836:	< 0.02	56	
			0.022	0.007	grain[c]			
					l-cyhalothrin:	0.05	28	
					R157836:	< 0.02	28	
					Compound Ia:	< 0.01	28	
					Compound V:	< 0.01	28	
USA,	EC 12	4	0.022	0.01	grain[a]			RR90-417B,
Yuma (AZ)			0.022	0.01	l-cyhalothrin:	< 0.02	88	38-AZ-87-665
					R157836:	< 0.02	88	
1987								Francis, 1991b
(Dekalb DK42Y)			0.022	0.01	grain[b]			
					l-cyhalothrin:	< 0.02	49	
					R157836:	< 0.02	49	
			0.022	0.01	grain[c]			
					l-cyhalothrin:	0.16	30	
					R157836:	< 0.02	30	
					Compound Ia:	< 0.01	30	
					Compound V:	< 0.01	30	

a after second treatment

b after third treatment

c after fourth treatment

R157836 = epimer of lambda-cyhalothrin

Table 92 Lambda-cyhalothrin residues in sugarcane following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.045	0.024	sugarcane			RR96-017B,
Rosa (LA)					l-cyhalothrin:	0.02	21	69-LA-95-311
						0.02	21	
1995					R157836:	< 0.01	21	Roper, 1996a
(321)						< 0.01	21	
USA,	EC 12	4	0.045	0.024	sugarcane			RR96-017B,
Washington (LA)					l-cyhalothrin:	0.03	26	69-LA-95-312
						0.01, 0.01 (0.01)	26	
1995					R157836:	< 0.01	26	Roper, 1996a
(357)						< 0.01	26	
USA,	EC 12	4	0.045	0.05	sugarcane			RR97-017B,
Belle Glade					l-cyhalothrin:	0.02	21	42-FL-96-575

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
						0.01	21	
1996					R157836:	< 0.01	21	Markle, 1997b
(1827)						< 0.01	21	
USA,	EC 12	4	0.045	0.017	sugarcane			RR97-017B,
Clewiston					l-cyhalothrin:	< 0.01	20	42-FL-96-576
						< 0.01	20	
1996					R157836:	< 0.01	20	Markle, 1997b
(CL77-797)						< 0.01	20	
USA,	EC 12	4	0.045	0.017	sugarcane			RR97-017B,
Clewiston					l-cyhalothrin:	0.03, < 0.01, < 0.01, < 0.01, < 0.01 (0.01)	20	42-FL-96-577
1996								Markle, 1997b
(CL73-239)						< 0.01	20	
					R157836:	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01 (< 0.01)	20	
						< 0.01	20	
USA,	EC 12	4	0.045	0.05	sugarcane			RR97-017B,
Washington					l-cyhalothrin:	0.02	20	69-LA-96-578
						0.02	20	
1996					R157836:	< 0.01	20	Markle, 1997b
(321)						< 0.01	20	
USA,	EC 12	4	0.045	0.03	sugarcane			RR97-017B,
Big Cane					l-cyhalothrin:	0.02	21	69-LA-96-579
						0.02	21	
1996					R157836:	< 0.01	21	Markle, 1997b
(CP 321)						< 0.01	21	
USA,	EC 12	4	0.045	0.05	sugarcane			RR97-017B,
Raymondville					l-cyhalothrin:	< 0.01	21	25-TX-96-580
						< 0.01, < 0.01 (< 0.01)	21	
1996								Markle, 1997b
(321)					R157836:	< 0.01	21	
						< 0.01, < 0.01 (< 0.01)	21	
USA,	EC 12	4	0.045	0.03	sugarcane			RR97-017B,
Haleiwa					l-cyhalothrin:	0.01	21	14-HI-96-581
						0.02	21	
1996					R157836:	< 0.01	21	Markle, 1997b
(74-4527)						< 0.01	21	
USA,	EC 12	4	0.22	0.12	sugarcane			RR96-024B,
Rosa (LA)					l-cyhalothrin:	0.24	21	69-LA-95-315
					R157836:	0.02	21	
1995								Roper, 1996d
(321)					sugarcane (RAC)			
					l-cyhalothrin:	0.18	21	
					R157836:	0.02	21	
					molasses			

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
					l-cyhalothrin:			
					R157836:	< 0.01	21	
						< 0.01	21	
					bagasse			
					l-cyhalothrin:			
					R157836:	0.46	21	
						0.05	21	
					refined sugar			
					l-cyhalothrin:			
					R157836:	< 0.01	21	
						< 0.01	21	

R157836 = epimer of lambda-cyhalothrin

Table 93 Lambda-cyhalothrin residues in almonds following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	CS 12	4	0.045	0.015	nutmeat			RR99-032B,
Visalia (CA)					l-cyhalothrin:	< 0.01	13	02-CA-98-801
						< 0.01	13	
1998					R157836:	< 0.01	13	Miller, 1999
(Thompson)						< 0.01	13	
USA,	CS 12	4	0.045	0.01	nutmeat			RR99-032B,
Chico (CA)					l-cyhalothrin:	< 0.01	14	17-CA-98-802
						< 0.01	14	
1998					R157836:	< 0.01	14	Miller, 1999
(Non Pareil)						< 0.01	14	
USA,	CS 12	4	0.045	0.01	nutmeat			RR99-032B,
Dunnigan (CA)					l-cyhalothrin:	< 0.01	14	17-CA-98-803
						< 0.01	14	
1998					R157836:	< 0.01	14	Miller, 1999
(Mission)						< 0.01	14	
USA,	CS 12	4	0.045	0.015	nutmeat			RR99-032B,
Esparto (CA)			0.045	0.002	l-cyhalothrin:	< 0.01	14	30-CA-98-804
			0.045	0.002		< 0.01	14	
1998			0.045	0.002	R157836:	< 0.01	14	Miller, 1999
(Carmel)						< 0.01	14	
USA,	CS 12	4	0.045	0.01	nutmeat			RR99-032B,
Hughson (CA)			0.045	0.002	l-cyhalothrin:	< 0.01	14	30-CA-98-805
			0.045	0.002		< 0.01	14	
1998			0.045	0.002	R157836:	< 0.01	14	Miller, 1999
(Carmel)						< 0.01	14	

R157836 = epimer of lambda-cyhalothrin

Table 94 Lambda-cyhalothrin residues in pecan nuts following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	CS 12	4	0.045	0.01	nutmeat			RR99-028B,
Lafayette (AL)					l-cyhalothrin:	< 0.01	13	44-AL-98-811
						< 0.01	13	
1998					R157836:	< 0.01	13	Miller, 1999a
(Cape Fear)						< 0.01	13	
USA,	CS 12	4	0.045	0.01	nutmeat			RR99-028B,
Camilla (GA)			0.045	0.002	l-cyhalothrin:	< 0.01	13	88-GA-98-812
			0.045	0.002		< 0.01	13	
1998			0.045	0.002	R157836:	< 0.01	13	Miller, 1999a
(Desirable)						< 0.01	13	
USA,	CS 12	4	0.045	0.01	nutmeat			RR99-028B,
Greenville (MS)					l-cyhalothrin:	< 0.01	14	05-MS-98-813
					R157836:	< 0.01	14	
1998								Miller, 1999a
(Assorted)								
USA,	CS 12	4	0.045	0.002	nutmeat			RR99-028B,
Greenville (MS)					l-cyhalothrin:	< 0.01	14	05-MS-98-813
					R157836:	< 0.01	14	
1998								Miller, 1999a
(Assorted)								
USA,	CS 12	4	0.045	0.01	nutmeat			RR99-028B,
Boling (TX)					l-cyhalothrin:	< 0.01	14	90-TX-98-814
					R157836:	< 0.01	14	
1998								Miller, 1999a
(Pawnee)								
USA,	CS 12	4	0.045	0.002	nutmeat			RR99-028B,
Boling (TX)					l-cyhalothrin:	< 0.01	14	90-TX-98-814
1998					R157836:	< 0.01	14	Miller, 1999a
(Pawnee)								
USA,	CS 12	4	0.045	0.01	nutmeat			RR99-028B,
Lockney (TX)					l-cyhalothrin:	< 0.01	14	23-TX-98-815
					R157836:	< 0.01	14	
1998								Miller, 1999a
(Western Schley)								
USA,	CS 12	4	0.045	0.002	nutmeat			RR99-028B,
Lockney (TX)					l-cyhalothrin:	< 0.01	14	23-TX-98-815
					R157836:	< 0.01	14	
1998								Miller, 1999a
(Western Schley)								

R157836 = epimer of lambda-cyhalothrin

Table 95 Lambda-cyhalothrin residues in oilseed rape following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	3	0.034	0.025	seeds			1263-99,
Girad (GA)					l-cyhalothrin:	< 0.01, 0.01 (0.01)	5	80-GA-99-261
						< 0.01	5	
1999					R157836:	< 0.01, < 0.01 (< 0.01)	5	Miller, 2000
(Oscar)						< 0.01	5	
USA,	EC 12	3	0.034	0.025	seeds			1263-99,
Whitakers (NC)					l-cyhalothrin:	< 0.01	7	01-NC-99-262
						< 0.01	7	
1999					R157836:	< 0.01	7	Miller, 2000
(Flint)						< 0.01	7	
USA,	EC 12	3	0.034	0.02	seeds			1263-99,
Campbell (MN)					l-cyhalothrin:	< 0.01	7	54-MN-99-263
						< 0.01, < 0.01 (< 0.01)	7	
1999								Miller, 2000
(Golden Ready)					R157836:	< 0.01	7	
						< 0.01, < 0.01 (< 0.01)	7	
USA,	EC 12	3	0.034	0.04	seeds			1263-99,
West Fargo (ND)					l-cyhalothrin:	< 0.01	7	54-ND-99-264
						< 0.01	7	
1999					R157836:	< 0.01	7	Miller, 2000
(Exceed)						< 0.01	7	
USA,	EC 12	3	0.034	0.035	seeds			1263-99,
Walla Walla (WA)					l-cyhalothrin:	0.05, 0.05 (0.05)	7	15-WA-99-266
						0.04	7	
1999					R157836:	< 0.01	7	Miller, 2000
(Liberty Link)						< 0.01, 0.01 (0.01)	7	
USA,	EC 12	3	0.034	0.04	seeds			1263-99,
Dayton (ID)					l-cyhalothrin:	0.04, 0.05 (0.05)	7	16-ID-99-267
						0.07	7	
1999					R157836:	0.04, 0.04 (0.04)	7	Miller, 2000
(Springfield)						0.05	7	
USA,	EC 12	3	0.034	0.035	seeds			1263-99,
Bonners Ferry (ID)					l-cyhalothrin:	0.02	7	15-ID-99-268
						0.01	7	
1999					R157836:	< 0.01	7	Miller, 2000
(IMC 105)						< 0.01	7	

R157836 = epimer of lambda-cyhalothrin

Table 96 Lambda-cyhalothrin residues in sunflower seeds following foliar application (ground)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA, Farwell (TX)	EC 12	3	0.034	0.02	seeds			TMU3003/B, 72-TX-84-014
					l-cyhalothrin:	< 0.01, < 0.01, < 0.01 (< 0.01)	45	
1984 (Olek)					R157836:	< 0.01, < 0.01, 0.01 (0.01)	45	Fitzpatrick, 1987
USA, Waverly (TX)	EC 12	3	0.034	0.02	seeds			TMU3003/B, 52-NB-84-064
					l-cyhalothrin:	< 0.01	46	
					R157836:	< 0.01	46	
1984 (Sundak)								Fitzpatrick, 1987
USA, Ft. Collins (CO)	EC 12	3	0.034	0.015	seeds			TMU3003/B, 37-CO-84-054
					l-cyhalothrin:	0.01, 0.01, 0.01 (0.01)	45	
1984 (Empire)					R157836:	< 0.01, < 0.01, < 0.01 (< 0.01)	45	Fitzpatrick, 1987
USA, Lenard (ND)	EC 12	3	0.034	0.01	seeds			TMU3003/B, 64-NB-84-081
					l-cyhalothrin:	< 0.01	43	
					R157836:	< 0.01	43	
1984 (Interstate 895)								Fitzpatrick, 1987
USA, Brookings (SD)	EC 12	3	0.034	0.02	seeds			TMU3003/B, 64-SD-84-083
					l-cyhalothrin:	0.01	45	
					R157836:	< 0.01	45	
1984 (Arrowhead 747)								Fitzpatrick, 1987
USA, Washburn (ND)	EC 12	3	0.034	0.03	seeds			RR91-054B, 34-ND-88-777
					l-cyhalothrin:	0.04	44	
					R157836:	< 0.01	44	
1988 (Pioneer 6440)		4[a]	0.034	0.03	seeds			Francis, 1994
					l-cyhalothrin:	< 0.01	44	
					R157836:	< 0.01	44	
USA, Sioux Falls (SD)	EC 12	3	0.034	0.02	seeds			RR91-054B, 11-SD-88-778
					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	55	
					R157836:			
1988 (Interstate 893)		4[a]	0.034	0.02		< 0.01, < 0.01 (< 0.01)	55	Francis, 1994
					seeds			
					l-cyhalothrin:	< 0.01	55	
					R157836:	< 0.01	55	
					Compound Ia:	< 0.01	55	
					Compound V:	< 0.01	55	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	3	0.034	0.018	seeds			RR91-054B,
Glyndon (MN)					l-cyhalothrin:	0.15	45	33-MN-88-779
					R157836:	0.01	45	
1988								Francis, 1994
(NK285)		4[a]	0.034	0.018	seeds			
					l-cyhalothrin:	0.07, 0.07 (0.07)	45	
					R157836:	< 0.01, < 0.01 (< 0.01)	45	
					Compound Ia:	0.01	45	
					Compound V:	< 0.01	45	
USA,	EC 12	3	0.034	0.024	seeds			RR91-054B,
Petersburg (TX)					l-cyhalothrin:	0.03	50	13-TX-88-780
					R157836:	< 0.01	50	
1988								Francis, 1994
(Tall Grey Stripe)		4[a]	0.034	0.024	seeds			
					l-cyhalothrin:	0.06	50	
					R157836:	< 0.01	50	
					Compound Ia:	0.01	50	
					Compound V:	< 0.01	50	
USA,	EC 12	3	0.034	0.024	seeds			RR91-054B,
Ft. Collins					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	45	39-CO-88-782
1988					R157836:	< 0.01, < 0.01 (< 0.01)	45	Francis, 1994
(not reported)		4[a]	0.034	0.024	seeds			
					l-cyhalothrin:	< 0.01	45	
					R157836:	< 0.01	45	
					Compound Ia:	< 0.01, < 0.01 (< 0.01)	45	
					Compound V:	< 0.01, < 0.01 (< 0.01)	45	
USA,	EC 12	3	0.034	0.03	seeds			RR91-054B,
Hughson (CA)					l-cyhalothrin:	< 0.01	45	18-CA-88-783
					R157836:	< 0.01	45	
1988								Francis, 1994
(SF-100)		4[a]	0.034	0.03	seeds			
					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	45	
					R157836:	< 0.01, < 0.01 (< 0.01)	45	

R157836 = epimer of lambda-cyhalothrin

a one additional application before the last treatment

Table 97 Lambda-cyhalothrin residues in sunflower seeds following application (aerial)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	3	0.034	0.17	seeds			TMU3003/B,
Akron (CO)					l-cyhalothrin:	< 0.01	49	37-CO-84-016
					R157836:	< 0.01	49	
1984								Fitzpatrick, 1987
(Cargill 206 & 207))								
USA,	EC 12	3	0.034	0.17	seeds			TMU3003/B,
Davenport (ND)					l-cyhalothrin:	< 0.01	45	64-ND-84-082
					R157836:	< 0.01	45	
1984								Fitzpatrick, 1987
(Hybrid 2141)								
USA,	EC 12	3	0.034	0.17	seeds			TMU3003/B,
Hays (KS)					l-cyhalothrin:	< 0.01	47	48-KS-84-065
					R157836:	< 0.01	47	
1984								Fitzpatrick, 1987
(Interstate 7780)								
USA,	EC 12	4	0.034	0.17	seeds			RR91-054B,
Washburn (ND)					l-cyhalothrin:	0.03	45	34-ND-90-715
					R157836:	< 0.01	45	
1990								Francis, 1994
(Pioneer 6440)								
USA,	EC 12	4	0.034	0.17	seeds			RR91-054B,
Heckville (TX)					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	45	13-TX-90-716
1990					R157836:	< 0.01, < 0.01 (< 0.01)	45	Francis, 1994
(Sigco 954)								

R157836 = epimer of lambda-cyhalothrin

Table 98 Lambda-cyhalothrin residues in cotton seeds following foliar application (ground)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	15	0.034	0.02	seeds			TMU1805,
Goldsboro (NC)			12x	12x	l-cyhalothrin:	0.1	23	USI-83S1501
					R157836:	0.01	23	
1983			0.12	0.07				Neal, 1985a
(McNair 220)			3x	3x	delinted seeds			
					l-cyhalothrin:	0.01	23	
					R157836:	< 0.01	23	
					linters			
					l-cyhalothrin:	0.38	23	
					R157836:	0.07	23	
					linter motes			
					l-cyhalothrin:	0.47	23	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
					R157836:	0.07	23	
					hulls			
					l-cyhalothrin:	0.01	23	
					R157836:	< 0.01	23	
					meal			
					l-cyhalothrin:	< 0.01	23	
					R157836:	< 0.01	23	
					crude oil			
					l-cyhalothrin:	0.02	23	
					R157836:	< 0.01	23	
					refined oil			
					l-cyhalothrin:	0.01	23	
					R157836:	< 0.01	23	
					soapstock			
					l-cyhalothrin:	0.02	23	
					R157836:	0.01	23	

R157836 = epimer of lambda-cyhalothrin

Table 99 Lambda-cyhalothrin residues in cotton seeds following application (aerial)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA, Lewisville (AR)	EC 12	15	0.045	0.1	seeds			TMU1778/B, 06-AR-84-019
					l-cyhalothrin:	< 0.01	21	
					R157836:	< 0.01	21	
1984 (Stoneville 825)								Neal, 1985
USA, Bard (CA)	EC 12	15	0.045	0.18	seeds			TMU1778/B, 38-CA-84-030
					l-cyhalothrin:	< 0.01	21	
					R157836:	< 0.01	21	
1984 (DPL 61)								Neal, 1985
USA, Yuma (AZ)	EC 12	15	0.045	0.18	seeds			TMU1778/B, 38-AZ-84-032
					l-cyhalothrin:	< 0.01	21	
					R157836:	< 0.01	21	
1984 (DPL 61)								Neal, 1985
USA, Cochran (GA)	EC 12	15	0.045	0.18	seeds			TMU1778/B, 83-GA-84-046
					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	20	
					R157836:	< 0.01, < 0.01 (< 0.01)	20	
1984 (Stoneville 825)								Neal, 1985

R157836 = epimer of lambda-cyhalothrin

Table 100 Lambda-cyhalothrin residues in peanuts following foliar application (ground)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.035	nutmeat			RR90-420B,
Statesboro (GA)					l-cyhalothrin:	< 0.02	0	83-GA-87-618
						< 0.02	14	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florunner)						< 0.02	14	
					Compound Ia:	< 0.01	0	
						< 0.02	14	
					Compound V:	< 0.01	0	
						< 0.02	14	
USA,	EC 12	4	0.034	0.015	nutmeat			RR90-420B,
Waller (TX)					l-cyhalothrin:	< 0.02	0	99-TX-87-619
						< 0.02	17	
1987					R157836:	< 0.02	0	McKay, 1991a
(Pronto Spanish)						< 0.02	17	
					Compound Ia:	< 0.01	0	
						< 0.01	17	
					Compound V:	< 0.01	0	
						< 0.01	17	
USA,	EC 12	4	0.034	0.04	nutmeat			RR90-420B,
Enterprise (AL)					l-cyhalothrin:	< 0.02	0	62-AL-87-620
						< 0.02	21	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florunner)						< 0.02	21	
					Compound Ia:	< 0.01	0	
						< 0.01	21	
					Compound V:	< 0.01	0	
						< 0.01	21	
USA,	EC 12	4	0.034	0.04	nutmeat			RR90-420B,
Enterprise (AL)					l-cyhalothrin:	< 0.02	0	62-AL-87-620P
						< 0.02	21	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florunner)						< 0.02	21	
					Compound Ia:	< 0.01	0	REPLICATE
						< 0.01	21	
					Compound V:	< 0.01	0	
						< 0.01	21	
USA,	EC 12	4	0.034	0.018	nutmeat			RR90-420B,
Pikeville (NC)					l-cyhalothrin:	< 0.02	0	US01-87-621
						< 0.02	20	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florigiant)						< 0.02	20	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.018	nutmeat			RR90-420B,
Pikeville (NC)					l-cyhalothrin:	< 0.02	0	US01-87-621P
						< 0.02	20	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florigiant)						< 0.02	20	
					Compound Ia:	< 0.01	0	REPLICATE
						< 0.01	20	
					Compound V:	< 0.01	0	
						< 0.01	20	
USA,	EC 12	4	0.034	0.013	nutmeat			RR90-420B,
Whaleyville (VA)					l-cyhalothrin:	< 0.02	0	61-VA-87-622
						< 0.02	14	
1987					R157836:	< 0.02	0	McKay, 1991a
(NC7)						< 0.02	14	
USA,	EC 12	4	0.034	0.024	nutmeat			RR90-420B,
Eakly (OK)					l-cyhalothrin:	< 0.02	0	72-OK-87-623
						< 0.02	28	
1987					R157836:	< 0.02	0	McKay, 1991a
(Spanco)						< 0.02	28	
USA,	EC 12	4	0.034	0.016	nutmeat			RR90-420B,
Newberry (FL)					l-cyhalothrin:	< 0.02	0	75-FL-87-624
						< 0.02	17	
1987					R157836:	< 0.02	0	McKay, 1991a
(Sun Runner)						< 0.02	17	
					Compound Ia:	< 0.01	0	
						< 0.01	17	
					Compound V:	< 0.01	0	
						< 0.01	17	
USA,	EC 12	4	0.034	0.035	nutmeat			RR90-420B,
Cochran (GA)					l-cyhalothrin:	< 0.02	0	83-GA-87-625
						< 0.02	14	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florunner)						< 0.02	14	
USA,	EC 12	4	0.034	0.013	nutmeat			RR90-420B,
Banks (AL)					l-cyhalothrin:	< 0.02	0	62-AL-87-626
						< 0.02	13	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florunner)						< 0.02	13	

R157836 = epimer of lambda-cyhalothrin

Table 101 Lambda-cyhalothrin residues in peanuts following application (aerial)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.1	nutmeat			RR90-420B,
Cochran					l-cyhalothrin:	< 0.02	0	83-GA-87-627
						< 0.02	14	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florunner)						< 0.02	14	
USA,	EC 12	4	0.034	0.12	nutmeat			RR90-420B,
Farwell (TX)					l-cyhalothrin:	< 0.02	0	72-TX-87-628
						< 0.02	25	
1987					R157836:	< 0.02	0	McKay, 1991a
(Valencia McRan)						< 0.02	25	
					Compound Ia:	< 0.01	0	
						< 0.01	25	
					Compound V:	< 0.01	0	
						< 0.01	25	
USA,	EC 12	4	0.034	0.35	nutmeat			RR90-420B,
Goldsboro (NC)					l-cyhalothrin:	< 0.02	0	61-NC-87-630
						< 0.02	16	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florigiant)						< 0.02	16	
					Compound Ia:	< 0.01	0	
						< 0.01	16	
					Compound V:	< 0.01	0	
						< 0.01	16	

R157836 = epimer of lambda-cyhalothrin

Table 102 Lambda-cyhalothrin residues in peanut hay following foliar application (ground)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.024	hay			RR96-073B,
Enterprise (AL)					l-cyhalothrin:	1.3	17	44-AL-95-221
						0.99	17	
1995					R157836:	0.25	17	Roper, 1996b
(Florunner)						0.19	17	
USA,	EC 12	4	0.034	0.024	hay			RR96-073B,
Headland (AL)					l-cyhalothrin:	1.6	24	44-AL_95-222
						0.91	24	
1995					R157836:	0.23	24	Roper, 1996b
(Florunner)						0.13	24	
USA,	EC 12	4	0.034	0.024	hay			RR96-073B,
Malone (FL)					l-cyhalothrin:	2.2	22	44-FL-95-223
						1.8	22	
1995					R157836:	0.41	22	Roper, 1996b
(Florunner)						0.32	22	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.024	hay			RR96-073B,
Sunsweet (GA)					l-cyhalothrin:	1.6	21	80-GA-95-224
						1.3	21	
1995					R157836:	0.32	21	Roper, 1996b
(Georgia Runner)						0.27	21	
USA,	EC 12	4	0.034	0.024	hay			RR96-073B,
Statesboro (GA)					l-cyhalothrin:	0.59	20	80-GA-95-225
						0.34	20	
1995					R157836:	0.12	20	Roper, 1996b
(Georgia Runner)						0.07	20	
USA,	EC 12	4	0.034	0.012	hay			RR96-073B,
Whitakers (NC)					l-cyhalothrin:	0.35	18	01-NC-95-226
						0.35	18	
1995					R157836:	0.06	18	Roper, 1996b
(VA92R)						0.06	18	
USA,	EC 12	4	0.034	0.03	hay			RR96-073B,
Windsor (NC)					l-cyhalothrin:	0.65	19	47-NC-95-227
						0.46	19	
1995					R157836:	0.11	19	Roper, 1996b
(NC7)						0.1	19	
USA,	EC 12	4	0.034	0.024	hay			RR96-073B,
Dill City (OK)					l-cyhalothrin:	1.3	19	23-OK-95-228
						0.87	19	
1995					R157836:	0.11	19	Roper, 1996b
(Spanco)						0.11	19	
USA,	EC 12	4	0.034	0.018	hay			RR96-073B,
Yoakum (TX)			0.034	0.018	l-cyhalothrin:	1.1	19	25-TX-95-229
			0.034	0.03		2.2	19	
1995			0.034	0.03	R157836:	0.18	19	Roper, 1996b
(Florunner)						0.29	19	
USA,	EC 12	4	0.034	0.018	hay			RR96-073B,
Brookshire (TX)			0.034	0.035	l-cyhalothrin:	0.43	20	25-TX-95-230
			0.034	0.018		0.54	20	
1995			0.034	0.018	R157836:	0.09	20	Roper, 1996b
(Spanish)						0.12	20	
USA,	EC 12	4	0.034	0.03	hay			RR96-073B,
Ivor (VA)					l-cyhalothrin:	0.91	21	47-VA-95-231
						1.4, 1.3 (1.4)	21	
1995					R157836:	0.11	21	Roper, 1996b
(NC10)						0.14, 0.13 (0.14)	21	

R157836 = epimer of lambda-cyhalothrin

Table 103 Lambda-cyhalothrin residues in soya bean fodder following foliar application (ground)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Mexico,	EC 7	2	0.035	0.01	seeds, dry			RJ1721B,
Sinaloa					l-cyhalothrin:	0.24	38	MX99-93-P707
						0.30	38	
1993					R157836:	0.08	38	Ryan, 1994
(Davis)						0.11	38	

R157836 = epimer of lambda-cyhalothrin

Table 104 Lambda-cyhalothrin residues in wheat forage following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	WG 12	2	0.034		forage			RR91-011B
Limon Co (CO)					l-cyhalothrin:	0.23, 0.18 (0.21)	7	39-CO-88-654
						0.31	7	
1988					R157836:	0.02, 0.01 (0.02)	7	Francis, 1991
(not reported)						0.02	7	
					Compound Ia:	0.01	7	
					Compound V:	< 0.01	7	
USA,	WG 12	2	0.034		forage			RR91-011B
Yoder (WY)					l-cyhalothrin:	0.35	7	41-WY-88-655
						0.51	7	
1998					R157836:	0.04	7	Francis, 1991
(Cheyenne)						0.03	7	
USA,	WG 12	2	0.034		forage			RR91-011B
Rulton (KS)					l-cyhalothrin:	0.27	7	39-KS-88-656
						< 0.01	7	
1988					R157836:	0.02	7	Francis, 1991
(Hawk)						< 0.01	7	
					Compound Ia:	0.03	7	
					Compound V:	< 0.01	7	
USA,	WG 12	2	0.034		forage			RR91-011B
Kearney (NE)					l-cyhalothrin:	0.81, 0.68 (0.75)	7	41-NE-88-657
						0.42	7	
1988					R157836:	0.06, 0.05 (0.06)	7	Francis, 1991
(Cody)						0.03	7	
					Compound Ia:	0.02, 0.02 (0.02)	7	
					Compound V:	0.01, 0.02 (0.02)	7	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	WG	2	0.034		forage			RR91-011B
Bloomfield (MT)	12				l-cyhalothrin:	0.91	6	34-MR-88-658
						0.33	7	
1988					R157836:	0.08	6	Francis, 1991
(Olat)						0.03	7	
					Compound Ia:	0.06	6	
						0.03	7	
					Compound V:	0.05	6	
						0.03	7	
USA,	WG	2	0.034		forage			RR91-011B
Yuma (AZ)	12				l-cyhalothrin:	0.37	7	14-AZ-88-660
						0.3	7	
1988					R157836:	0.03	7	Francis, 1991
(Yecora Rojo)						0.02	7	
USA,	EC 12	2	0.034		forage			RR91-011B
Yuma (AZ)					l-cyhalothrin:	0.65	7	14-AZ-88-660
						0.09	7	
1988					R157836:	0.05	7	Francis, 1991
(Yecora Rojo)						0.05	7	
					Compound Ia:	0.03, 0.03 (0.03)	7	
					Compound V:	0.04, 0.04 (0.04)	7	
USA,	WG	2	0.034		forage			RR91-011B
Chico (CA)	12				l-cyhalothrin:	0.59	7	20-CA-88-663
						0.5	7	
1988					R157836:	0.07	7	Francis, 1991
(Yolo)						0.04	7	
					Compound Ia:	0.03	7	
					Compound V:	0.02	7	
USA,	WG	2	0.034		forage			RR91-011B
Stockton (CA)	12				l-cyhalothrin:	0.33	7	17-CA-88-664
						0.2, 0.19 (0.2)	7	
1988					R157836:	0.03	7	Francis, 1991
(Yecora Rojo)						0.02, 0.02 (0.02)	7	
USA,	EC 12	2	0.034		forage			RR91-011B
Stockton (CA)					l-cyhalothrin:	0.35	7	17-CA-88-664
						0.29	7	
1988					R157836:	0.03	7	Francis, 1991
(Yecora Rojo)						0.02	7	
					Compound Ia:	0.03	7	
					Compound V:	0.02	7	
USA,	WG	2	0.034		forage			RR91-011B
Enterprise (AL)	12				l-cyhalothrin:	< 0.01	43	44-AL-88-665
						< 0.01	43	
1988					R157836:	< 0.01	43	Francis, 1991
(Florida 302)						< 0.01	43	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	2	0.034		forage			RR91-011B
Enterprise (AL)					l-cyhalothrin:	< 0.01	43	44-AL-88-665
						< 0.01	43	
1988					R157836:	< 0.01	43	Francis, 1991
(Florida 302)						0.02	43	
USA,	WG 12	2	0.034		forage			RR91-011B
Pullman (WA)					l-cyhalothrin:	0.24	7	15-WA-88-666
						0.28, 0.24 (0.26)	8	
1988					R157836:	0.02	7	Francis, 1991
(Hill 81 Soft White)						0.03, 0.03 (0.03)	8	
USA,	EC 12	2	0.034		forage			RR91-011B
Pullman (WA)					l-cyhalothrin:	0.43	7	15-WA-88-666
						0.29	8	
1988					R157836:	0.05	7	Francis, 1991
(Hill 81 Soft White)						0.03	8	
					Compound Ia:	0.03, 0.03 (0.03)	8	
					Compound V:	0.01, 0.01 (0.01)	8	
USA,	WG 12	2	0.034		forage			RR91-011B
Columbia (LA)					l-cyhalothrin:	0.24	8	51-LA-88-667
						0.38	8	
1988					R157836:	0.03	8	Francis, 1991
(Florida 302)						0.04	8	
USA,	EC 12	2	0.034		forage			RR91-011B
Columbia (LA)					l-cyhalothrin:	0.71	8	51-LA-88-667
						0.4	8	
1988					R157836:	0.09	8	Francis, 1991
(Florida 302)						0.05	8	
USA,	WG 12	2	0.034		forage			RR91-011B
Heartland (IN)					l-cyhalothrin:	0.19	7	24-IN-88-668
						0.1	7	
1988					R157836:	0.02	7	Francis, 1991
(Cladwell)						0.01	7	
USA,	EC 12	2	0.034		forage			RR91-011B
Heartland (IN)					l-cyhalothrin:	0.3, 0.29 (0.3)	7	24-IN-88-668
						0.16	7	
1988					R157836:	0.04, 0.03 (0.04)	7	Francis, 1991
(Cladwell)						0.02	7	
					Compound Ia:	0.07, 0.1	7	
					Compound V:	0.01, 0.02	7	
USA,	WG 12	2	0.034		forage			RR91-011B
Yuma (AZ)					l-cyhalothrin:	0.3	7	14-AZ-88-669
						0.27	7	
1988					R157836:	0.03	7	Francis, 1991
(not reported)						0.03	7	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	2	0.034		forage			RR91-011B
Yuma (AZ)					l-cyhalothrin:	0.43	7	14-AZ-88-669
						0.38	7	
1988					R157836:	0.04	7	Francis, 1991
(not reported)						0.03	7	
USA,	EC 12	2	0.034		forage			RR91-011B
Paynesville (MN)					l-cyhalothrin:	0.36, 0.34 (0.35)	7	33-MN-89-671
					R157836:	0.03, 0.03 (0.03)	7	
1989					Compound Ia:	0.03	7	Francis, 1991
(Marshall)					Compound V:	0.02	7	
USA,	EC 12	2	0.034		forage			RR91-011B
Washbury (ND)					l-cyhalothrin:	1.2, 1.1 (1.2)	7	34-ND-89-673
					R157836:	0.1, 0.09 (0.1)	7	
1989					Compound Ia:	0.16	7	Francis, 1991
(Pioneer 2375)					Compound V:	0.04	7	
USA,	EC 12	2	0.034		forage			RR91-011B
Volga (SD)					l-cyhalothrin:	0.29	7	31-SD-89-674
					R157836:	0.02	7	
1989					Compound Ia:	< 0.01, < 0.01 (< 0.01)	7	Francis, 1991
(Gaurd)					Compound V:	< 0.01, < 0.01 (< 0.01)	7	
Germany,	EC 5	3	0.01	0.0025	forage	0.22	0	M4011B,
Bad Bergzabern						0.04	14	RS 8416 E1
1984								Sapiets, 1985d
(Turbo)								
Germany,	EC 5	3	0.01	0.0025	forage	0.11	0	M4146B,
Moelln						0.06	14	RS 8516 B1
						0.01	28	
1985						0.02	35	Ruskin, 1986
(Kanzler)								
Germany,	EC 5	3	0.01	0.0025	forage	0.54	0	RJ1464B,
Kapellen-Drusweiler						0.11	14	RS-9211-E1
						0.04	28	
1992								Ryan, 1993
(Ambral)								
Germany,	WG 5	3	0.01	0.0025	forage	0.5	0	RJ1464B,
Kapellen-Drusweiler						0.11	14	RS-9211-E1
						0.04	28	
1992								Ryan, 1993
(Ambral)								
Germany,	EC 5	3	0.01	0.0025	forage	0.52	0	RJ1464B,
Kleindroeben						0.06	13	RS-9211-I2
						0.06	27	
1992								Ryan, 1993
(Borenos)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Kleindroeben	WG 5	3	0.01	0.0025	forage	0.46	0	RJ1464B,
						0.07	13	RS-9211-I2
						0.05	27	
1992 (Borenos)								Ryan, 1993

R157836 = epimer of lambda-cyhalothrin

Table 105 Lambda-cyhalothrin residues in barley forage following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South), Renneville	EC 5	2	0.01	0.005	forage	0.38	0	17915
						0.26	7	AF/4150/IV/1
						0.43	14	
1998 (Nevada)						0.55	18	Old, 1999d
France (South) Aucamville	EC 5	2	0.01	0.005	forage	0.34	0	17915
						0.42	7	AF/4150/IV/2
						0.25	14	
1998 (Kelibia)						0.33	18	Old, 1999d
Spain, Villanueva de los Infantes	EC 5	2	0.01	0.005	forage	0.42	0	17915
						0.32	3	AF/4150/IV/3
						0.36	7	
1998 (Caballar)						0.32	10	Old, 1999d
Spain, El Bonillo	EC 5	2	0.01	0.005	forage	0.92	0	17915
						0.02	3	AF/4150/IV/4
1998						0.54	7	
(Cervecera)						0.41	10	Old, 1999d
France (South), Renneville	EC 5	2	0.02	0.01	forage	0.72	0	17915
						0.36	7	AF/4150/IV/1
						0.86	14	
1998 (Nevada)						0.72	18	Old, 1999d
France (South) Aucamville	EC 5	2	0.02	0.01	forage	0.72	0	17915
						0.59	7	AF/4150/IV/2
						0.67	14	
1998 (Kelibia)						0.68	18	Old, 1999d
Spain, Villanueva de los Infantes	EC 5	2	0.02	0.01	forage	1.4	0	17915
						0.83	3	AF/4150/IV/3
						0.77	7	
						0.7	10	Old, 1999d

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
1998 (Caballar)								
Spain, El Bonillo	EC 5	2	0.02	0.01	forage	1.1 0.39 0.8	0 3 7	17915 AF/4150/IV/4
1998 (Cervecera)						0.77	10	Old, 1999d
France (South), St. Benigne	CS 10	2	0.01	0.003	forage	0.05 0.24 0.22	0[a] 0 7	AF/8672/SY, AF/8672/SY/1 Plot 7
2005 (Verticale)						0.14	14	North, 2006f
Spain, Calatorao	CS 10	2	0.01	0.003	forage	0.08 0.24 0.14	0[a] 0 7	AF/8672/SY, AF/8672/SY/2 Plot 7
2005 (Sultane)						0.11	14	North, 2006f
Spain, Villarreal de Huerva	CS 10	2	0.01	0.003	forage	0.07 0.28 0.16	0[a] 0 7	AF/8672/SY, AF/8672/SY/3 Plot 7
2005 (Montage)						0.11	14	North, 2006f
Italy, Quarto Inferiore	CS 10	2	0.01	0.003	forage	0.05 0.18 0.07	0[a] 0 7	AF/8672/SY, AF/8672/SY/4 Plot 7
2005 (Siberia)						0.09	14	North, 2006f
Germany, Ratzeburg	EC 5	3	0.01	0.0025	forage	0.88 0.23 0.12	0 14 28	M4011B, RS 8416 B1
1984 (Tapir)						0.35	35	Sapiets, 1985d
Germany, Dabrun-Melzwig	EC 5	3	0.01	0.0025	forage	0.52 0.06 0.06	0 13 27	RJ1464B, RS-9211-I1
1992 (Nixe)								Ryan, 1993
Germany, Dabrun-Melzwig	WG 5	3	0.01	0.0025	forage	0.46 0.07 0.05	0 13 27	RJ1464B, RS-9211-I1
1992 (Nixe)								Ryan, 1993

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Rade	WG 2	3	0.005	0.001	forage	0.07 0.02	0 20	RJ1818B, RS-9430-K1
1994 (Teo)								Robinson, 1995
Germany, Rade	WG 5	3	0.0075	0.002	forage	0.15 0.04	0 20	RJ1818B, RS-9430-K1
1994 (Teo)								Robinson, 1995

[a] before last treatment

Table 106 Lambda-cyhalothrin residues in oats forage following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Wernersberg	EC 5	3	0.01	0.0025	forage	0.3	0	M4146B, RS 8516 E1
1985 (Cambo)								Ruskin, 1986
Germany, Ziethen	EC 5	3	0.01	0.0025	forage	0.24 0.04 0.02	0 14 28	RJ1464B, RS-9211-B1
1992 (Alfred)								Ryan, 1993
Germany, Ziethen	WG 5	3	0.01	0.0025	forage	0.24 0.04 0.03	0 14 28	RJ1464B, RS-9211-B1
1992 (Alfred)								Ryan, 1993
Germany, Gehmen	WG 2	3	0.005	0.001	forage	0.08 0.02	0 19	RJ1818B, RS-9430-K2
1994 (Salomon)								Robinson, 1995
Germany, Gehmen	WG 5	3	0.0075	0.002	forage	0.17 0.06	0 19	RJ1818B, RS-9430-K2
1994 (Salomon)								Robinson, 1995

Table 107 Lambda-cyhalothrin residues in rye forage following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Varendorf	WG 2	3	0.005	0.001	forage	0.07 0.01	0 21	RJ1818B, RS-9430-B1

		Application data			Residues data			
1994 (Marder)								Robinson, 1995
Germany, Varendorf 1994 (Marder)	WG 5	3	0.0075	0.002	forage	0.15 0.05	0 21	RJ1818B, RS-9430-B1 Robinson, 1995

Table 108 Lambda-cyhalothrin residues in triticale forage following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Inchenhofen	WG 2	3	0.005	0.001	forage	0.02 0.03	0 20	RJ1818B, RS-9430-G1
1994 (Modus)								Robinson, 1995
Germany, Inchenhofen	WG 5	3	0.0075	0.002	forage	0.16 0.05	0 20	RJ1818B, RS-9430-G1
1994 (Modus)								Robinson, 1995

Table 109 Lambda-cyhalothrin residues in maize and sweetcorn forage, silage and fodder following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034		forage			RR90-428B
W.Liberty (IA)					l-cyhalothrin:	0.04, 0.03 (0.04)	32	36-IA-88-689
					R157836:	0.01, < 0.01 (0.01)	32	
1988					Compound Ia:	0.01	32	McKay, 1991
(Pioneer 3471)					Compound V:	< 0.01	32	
					silage			
					l-cyhalothrin:	0.06	18	
					R157836:	< 0.01	18	
					Compound Ia:	0.01	18	
					Compound V:	0.01	18	
					fodder			
					l-cyhalothrin:	0.22	21	
					R157836:	0.02	21	
					Compound Ia:	0.04	21	
					Compound V:	0.02	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	WG	4	0.034		forage			RR90-428B
W.Liberty (IA)	12				l-cyhalothrin:	0.03	32	36-IA-88-689
					R157836:	< 0.01	32	
1988								McKay, 1991
(Pioneer 3471)					silage			
					l-cyhalothrin:	0.12	18	
					R157836:	< 0.01	18	
					fodder			
					l-cyhalothrin:	0.1	21	
					R157836:	< 0.01	21	
USA,	WG	4	0.034		forage			RR90-428B
Gallen (MI)	12				l-cyhalothrin:	0.02	21	28-MI-88-690
					R157836:	< 0.01	21	
1988								McKay, 1991
(Jacques 7770)					silage			
					l-cyhalothrin:	0.02	22	
					R157836:	< 0.01	22	
					fodder			
					l-cyhalothrin:	0.15	21	
					R157836:	0.01	21	
USA,	EC 12	4	0.034		forage			RR90-428B
Mulkeytown (IL)					l-cyhalothrin:	< 0.01	25	22-IL-88-691
					R157836:	< 0.01	25	
1988					Compound Ia:	< 0.01	25	McKay, 1991
(Super Crost 5460)					Compound V:	< 0.01	25	
					silage			
					l-cyhalothrin:	0.17	26	
					R157836:	0.02	26	
					Compound Ia:	0.02	26	
					Compound V:	0.01	26	
					fodder			
					l-cyhalothrin:	0.24	21	
					R157836:	0.02	21	
					Compound Ia:	0.02, 0.03 (0.03)	21	
					Compound V:	0.01, 0.01 (0.01)	21	
USA,	WG	4	0.034		forage			RR90-428B
Mulkeytown (IL)	12				l-cyhalothrin:	< 0.01	25	22-IL-88-691
					R157836:	< 0.01	25	
1988								McKay, 1991
(Super Crost 5460)					silage			
					l-cyhalothrin:	< 0.01	26	
					R157836:	< 0.01	26	
					fodder			
					l-cyhalothrin:	0.19	21	
					R157836:	0.02	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034		forage			RR90-428B
Owatonna (MN)					l-cyhalothrin:	0.01	27	30-MN-88-692
					R157836:	< 0.01	27	
1988					Compound Ia:	< 0.01	27	McKay, 1991
(Hubert Anderson A-95)					Compound V:	< 0.01	27	
					silage			
					l-cyhalothrin:	0.02, 0.02 (0.02)	36	
					R157836:	< 0.01, < 0.01 (< 0.01)	36	
					Compound Ia:	0.01	36	
					Compound V:	< 0.01	36	
					fodder			
					l-cyhalothrin:	0.23	21	
					R157836:	0.04	21	
					Compound Ia:	0.03, 0.03 (0.03)	21	
					Compound V:	0.01, 0.01 (0.01)	21	
USA,	WG 12	4	0.034		forage			RR90-428B
Owatonna (MN)					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	27	30-MN-88-692
1988					R157836:	< 0.01, < 0.01 (< 0.01)	27	McKay, 1991
(Hubert Anderson A-95)					silage			
					l-cyhalothrin:	0.02	36	
					R157836:	< 0.01	36	
					fodder			
					l-cyhalothrin:	< 0.01	21	
					R157836:	< 0.01	21	
USA,	WG 12	4	0.034		forage			RR90-428B
Chariton (MO)					l-cyhalothrin:	0.01	27	40-MO-88-693
					R157836:	< 0.01	27	
1988								McKay, 1991
(Epley 444e)					fodder			
					l-cyhalothrin:	0.34	21	
					R157836:	0.05	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034		forage			RR90-428B
Kearney (NE)					l-cyhalothrin:	< 0.01	31	41-NE-88-694
					R157836:	< 0.01	31	
1988					Compound Ia:	< 0.01	31	McKay, 1991
(Northrup King 5940)					Compound V:	< 0.01	31	
					silage			
					l-cyhalothrin:	0.04	27	
					R157836:	< 0.01	27	
					Compound Ia:	< 0.01	27	
					Compound V:	< 0.01	27	
					fodder			
					l-cyhalothrin:	0.2	25	
					R157836:	0.02	25	
					Compound Ia:	0.01, 0.02 (0.02)	25	
					Compound V:	0.01, 0.01 (0.01)	25	
USA,	WG 12	4	0.034		forage			RR90-428B
Kearney (NE)					l-cyhalothrin:	< 0.01	31	41-NE-88-694
					R157836:	< 0.01	31	
1988								McKay, 1991
(Northrup King 5940)					silage			
					l-cyhalothrin:	0.02	27	
					R157836:	0.02	27	
					fodder			
					l-cyhalothrin:	0.13	25	
					R157836:	< 0.01	25	
USA,	EC 12	4	0.034		forage			RR90-428B
Martinsville (IN)					l-cyhalothrin:	< 0.01	42	24-IN-88-695
					R157836:	< 0.01	42	
1988					Compound Ia:	< 0.01	42	McKay, 1991
(Agrigold A6611)					Compound V:	< 0.01	42	
					silage			
					l-cyhalothrin:	0.05, 0.05, 0.02 (0.03)	40	
					R157836:	< 0.01, < 0.01, < 0.01 (< 0.01)	40	
					Compound Ia:	0.01	40	
					Compound V:	< 0.01	40	
					fodder			
					l-cyhalothrin:	0.13	39	
					R157836:	0.02	39	
					Compound Ia:	< 0.01	39	
					Compound V:	< 0.01	39	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA, Martinsville (IN)	WG 12	4	0.034		forage			RR90-428B
					l-cyhalothrin:	< 0.01	42	24-IN-88-695
					R157836:	< 0.01	42	
1988								McKay, 1991
(Agrigold A6611)					silage			
					l-cyhalothrin:	< 0.01	40	
					R157836:	< 0.01	40	
					fodder			
					l-cyhalothrin:	0.11	39	
					R157836:	0.02	39	
USA, Wooster (OH)	WG 12	4	0.034		forage			RR90-428B
					l-cyhalothrin:	0.01	35	27-OH-88-696
					R157836:	< 0.01	35	
1988								McKay, 1991
(not reported)					silage			
					l-cyhalothrin:	0.1, 0.07 (0.09)	1	
					R157836:	< 0.01, < 0.01 (< 0.01)	1	
					fodder			
					l-cyhalothrin:		25	
					R157836:	0.28 0.03	25	
USA, Waterloo (WI)	EC 12	4	0.034		forage			RR90-428B
					l-cyhalothrin:	0.01	22	32-WI-88-697
					R157836:	< 0.01	22	
1988					Compound Ia:	< 0.01	22	McKay, 1991
(PX9353)					Compound V:	< 0.01	22	
					silage			
					l-cyhalothrin:	0.02	37	
					R157836:	< 0.01	37	
					Compound Ia:	0.01	37	
					Compound V:	0.01	37	
					fodder			
					l-cyhalothrin:	0.4	21	
					R157836:	0.06	21	
					Compound Ia:	0.04, 0.08 (0.06)	21	
					Compound V:	0.04, 0.04 (0.04)	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA, Waterloo (WI)	WG 12	4	0.034		forage			RR90-428B
					l-cyhalothrin:	0.01	22	32-WI-88-697
					R157836:	< 0.01	22	
1988 (PX9353)								McKay, 1991
					silage			
					l-cyhalothrin:	0.01, 0.01 (0.01)	37	
					R157836:	< 0.01, < 0.01 (< 0.01)	37	
					fodder			
					l-cyhalothrin:	0.13	21	
					R157836:	0.01	21	
USA, Sioux Falls (SD)	WG 12	4	0.034		forage			RR90-428B
					l-cyhalothrin:	0.03, 0.02 (0.03)	32	31-SD-88-698
					R157836:	< 0.01, < 0.01 (< 0.01)	32	
1988 (not reported)								McKay, 1991
					fodder			
					l-cyhalothrin:	0.23	21	
					R157836:	0.04	21	
USA, Goldsboro (NC)	WG 12	4	0.034		forage			RR90-428B
					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	43	47-NC-88-699
1988 (Pioneer 3165)					R157836:	< 0.01, < 0.01 (< 0.01)	43	McKay, 1991
					silage			
					l-cyhalothrin:	0.14	21	
					R157836:	0.02	21	
					fodder			
					l-cyhalothrin:	0.05	20	
					R157836:	< 0.01	20	
USA, Goldsboro (NC)	EC 12	4	0.034		forage			RR90-428B
					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	38	47-NC-88-702
1988 (Pioneer 3165)					R157836:	< 0.01, < 0.01 (< 0.01)	38	McKay, 1991
					Compound Ia:	< 0.01	38	
					Compound V:	< 0.01	38	
					silage			
					l-cyhalothrin:	0.05	17	
					R157836:	< 0.01	17	
					fodder			
					l-cyhalothrin:	0.19	21	
					R157836:	0.03	21	
					Compound Ia:	0.02, 0.04 (0.03)	21	
					Compound V:	0.01, 0.01 (0.01)	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034		forage			RR90-428B
W. Des Moines (IA)					l-cyhalothrin:	< 0.01	36	35-IA-88-703
					R157836:	< 0.01	36	
1988					Compound Ia:	< 0.01	36	McKay, 1991
(Pioneer 3475)					Compound V:	< 0.01	36	
					silage			
					l-cyhalothrin:	0.56	25	
					R157836:	0.04	25	
					Compound Ia:	0.03, 0.03 (0.03)	25	
					Compound V:	0.02, 0.03 (0.03)	25	
					fodder			
					l-cyhalothrin:	< 0.01	21	
					R157836:	< 0.01	21	
					Compound Ia:	< 0.01	21	
					Compound V:	< 0.01	21	
USA,	WG 12	4	0.034		forage			RR90-428B
Wood River (NE)					l-cyhalothrin:	< 0.01	22	38-NE-88-704
					R157836:	< 0.01	22	
1988								McKay, 1991
(Keltgen 2750)					silage			
					l-cyhalothrin:	0.01	39	
					R157836:	< 0.01	39	
					fodder			
					l-cyhalothrin:	0.12	24	
					R157836:	0.01	24	
USA,	WG 12	4	0.034		forage			RR90-428B
Geneseo (IL)					l-cyhalothrin:	< 0.01	33	26-IL-88-705
					R157836:	< 0.01	33	
1988								McKay, 1991
(Pioneer 3475)					silage			
					l-cyhalothrin:	< 0.01	14	
					R157836:	< 0.01	14	
					fodder			
					l-cyhalothrin:	0.18	19	
					R157836:	0.03	19	
USA,	EC 12	12	0.045		forage			RR95-095B,
North Rose (NY)					l-cyhalothrin:	2.3	1	57-NY-95-206
						2.3	1	
1995					R157836:	0.37	1	Francis, 1996
(Crusader 4399 LF)						0.36	1	
USA,	EC 12	12	0.045		forage			RR95-095B,
Oviedo (FL)					l-cyhalothrin:	1.7	1	42-FL-95-207
						2.8	1	
1995					R157836:	0.24	1	Francis, 1996
(Florida Stay Sweet)						0.37	1	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	12	0.045		forage			RR95-095B,
Delavan (WI)					l-cyhalothrin:	1.3	1	79-WI-95-208
						1.4	1	
1995					R157836:	0.17	1	Francis, 1996
(Melody)						0.21	1	
USA,	CS 12	12	0.045		forage			RR95-095B,
North Rose (NY)					l-cyhalothrin:	1.5	1	57-NY-95-206
						1.7	1	
1995					R157836:	0.26	1	Francis, 1996
(Crusader 4399 LF)						0.29	1	
USA,	CS 12	12	0.045		forage			RR95-095B,
Oviedo (FL)					l-cyhalothrin:	1.4	1	42-FL-95-207
						1.8, 2.1 (2.0)	1	
1995					R157836:	0.21	1	Francis, 1996
(Florida Stay Sweet)						0.27, 0.31 (0.29)	1	
USA,	CS 12	12	0.045		forage			RR95-095B,
Delavan (WI)					l-cyhalothrin:	1.2	1	79-WI-95-208
						0.97	1	
1995					R157836:	0.18	1	Francis, 1996
(Melody)						0.15	1	

R157836 = epimere of lambda-cyhalothrin

Table 110 Lambda-cyhalothrin residues in sorghum forage and fodder following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	3	0.034	0.024	forage[a]			RR96-080B,
Shoffner (AR)			0.034	0.024	l-cyhalothrin:	0.11	24	49-AR-95-241
						0.16	24	
1995					R157836:	0.01	24	Markle, 1996
(Cherokee)						0.02	24	
			0.022	0.016	fodder[b]			
					l-cyhalothrin:	0.12	30	
						0.1	30	
					R157836:	0.02		
						0.02		
USA,	EC 12	3	0.034	0.03	forage[a]			RR96-080B,
Scott (AZ)			0.034	0.03	l-cyhalothrin:	0.14	28	49-AZ-95-242
						0.12	28	
1995					R157836:	0.02	28	Markle, 1996
(Pioneer 3305)						0.01	28	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	3	0.034	0.015	forage[a]			RR96-080B,
Yuma (AZ)			0.034	0.015	l-cyhalothrin:	0.21	18	14-AZ-95-243
						0.21	18	
1995					R157836:	0.02	18	Markle, 1996
(Cargill Hybrid 577)						0.02	18	
			0.022	0.01	fodder[b]			
					l-cyhalothrin:	0.1	30	
						0.1, 0.09 (0.1)	30	
					R157836:	0.02	30	
						0.01, 0.02 (0.02)	30	
USA,	EC 12	3	0.034	0.013	forage[a]			RR96-080B,
Visalia (CA)			0.034	0.013	l-cyhalothrin:	0.08	24	02CA-95-244
						0.07	24	
1995					R157836:	0.01	24	Markle, 1996
(NK Hybrid 1580)						< 0.01	24	
			0.022	0.008	fodder[b]			
					l-cyhalothrin:	0.08	30	
						0.08	30	
					R157836:	0.01	30	
						0.01	30	
USA,	EC 12	3	0.034	0.024	forage[a]			RR96-080B,
Ft. Collins (CO)			0.034	0.024	l-cyhalothrin:	0.09	24	48-CO-95-245
						0.11	24	
1995					R157836:	< 0.01	24	Markle, 1996
(Pioneer 8500)						0.01	24	
			0.022	0.016	fodder[b]			
					l-cyhalothrin:	0.08	30	
						0.11	30	
					R157836:	< 0.01	30	
						0.01	30	
USA,	EC 12	3	0.034	0.024	forage[a]			RR96-080B,
Statesboro (GA)			0.034	0.024	l-cyhalothrin:	0.27	16	80-GA-95-246
						0.18	16	
1995					R157836:	0.02	16	Markle, 1996
(NK2600)						0.02	16	
			0.022	0.016	fodder[b]			
					l-cyhalothrin:	0.14	30	
						0.21	30	
					R157836:	0.01	30	
						0.02	30	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	3	0.034	0.018	forage[a]			RR96-080B,
Carlyle (IL)			0.034	0.018	l-cyhalothrin:	0.2, 0.23 (0.22)	24	60-IL-95-247
						0.07, 0.08 (0.08)	24	
1995					R157836:	0.02, 0.01 (0.02)	24	Markle, 1996
(Northrup King 1210)						< 0.01, 0.02 (0.01)	24	
			0.022	0.018	fodder[b]			
					l-cyhalothrin:	0.24	30	
						0.25	30	
					R157836:	0.02	30	
						0.02	30	
USA,	EC 12	3	0.034	0.024	forage[a]			RR96-080B,
La Cygne			0.034	0.024	l-cyhalothrin:	0.06	23	37-KS-95-248
						0.09	23	Markle, 1996
1995					R157836:	< 0.01	23	
(Ciba 1655)						< 0.01	23	
			0.022	0.016	fodder[b]			
					l-cyhalothrin:	0.07	30	
						0.12	30	
					R157836:	< 0.01	30	
						< 0.01	30	
USA,	EC 12	3	0.034	0.024	forage[a]			RR96-080B,
DeSoto (KS)			0.034	0.024	l-cyhalothrin:	0.06	31	37-KS-95-249
						0.05	31	
1995					R157836:	0.01	31	Markle, 1996
(Cargill 837 CS)						< 0.01	31	
			0.022	0.016	fodder[b]			
					l-cyhalothrin:	0.15	30	
						0.09	30	
					R157836:	0.01	30	
						< 0.01	30	
USA,	EC 12	3	0.034	0.013	forage[a]			RR96-080B,
Whitakers (NC)			0.034	0.018	l-cyhalothrin:	0.07	33	01-NC-95-250
						0.09	33	
1995					R157836:	< 0.01	33	Markle, 1996
(Hyperformer 1289)						0.01	33	
			0.022	0.016	fodder[b]			
					l-cyhalothrin:	0.11	30	
						0.08	30	
					R157836:	0.01	30	
						0.01	30	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	3	0.034	0.024	forage [a]			RR96-080B,
Waverly (NE)			0.034	0.024	l-cyhalothrin:	0.18	21	68-NE-95-251
						0.15	21	
1995					R157836:	0.02	21	Markle, 1996
(Dekalb 56)						0.01	21	
			0.022	0.016	fodder [b]			
					l-cyhalothrin:	0.33	30	
						0.17	30	
					R157836:	0.04	30	
						0.02	30	
USA,	EC 12	3	0.034	0.03	forage [a]			RR96-080B,
Scotland (SD)			0.034	0.03	l-cyhalothrin:	0.06	25	34-SD-95-252
						0.1	25	
1995					R157836:	< 0.01	25	Markle, 1996
(Dekalb 28E)						< 0.01	25	
			0.022	0.02	fodder [b]			
					l-cyhalothrin:	0.38	30	
						0.27	30	
					R157836:	0.03	30	
						0.03	30	
USA,	EC 12	3	0.034	0.03	forage [a]			RR96-080B,
West Sinton (TX)			0.034	0.03	l-cyhalothrin:	< 0.01	18	25-TX-95-253
						< 0.01, < 0.01 (< 0.01)	18	
1995							18	Markle, 1996
(Chaparral-Asgrow)					R157836:	< 0.01	18	
						< 0.01, < 0.01 (< 0.01)		
			0.022	0.02				
					fodder [b]			
					l-cyhalothrin:	0.16	30	
						0.17	30	
					R157836:	0.02	30	
						0.02	30	

a after second treatment

b after third treatment

R157836 = epimer of lambda-cyhalothrin

Table 111 Lambda-cyhalothrin residues in wheat straw following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	WG 12	2	0.034		straw			RR91-011B
Limon Co (CO)					l-cyhalothrin:	0.33, 0.28 (0.31)	30	39-CO-88-654
						0.24	40	
1988					R157836:	0.02, 0.02 (0.02)	30	Francis, 1991
(not reported)						0.02	40	
					Compound Ia:	0.02, 0.02 (0.02)	30	
					Compound V:	0.01, 0.01 (0.01)	30	
USA,	WG 12	2	0.034		straw			RR91-011B
Yoder (WY)					l-cyhalothrin:	0.28	30	41-WY-88-655
						0.02	45	
1998					R157836:	0.02	30	Francis, 1991
(Cheyenne)						< 0.01	45	
USA,	WG 12	2	0.034		straw			RR91-011B
Rulton (KS)					l-cyhalothrin:	0.26	30	39-KS-88-656
						0.14	45	
1988					R157836:	0.02	30	Francis, 1991
(Hawk)						0.01	45	
					Compound Ia:	0.04, 0.04 (0.04)	30	
					Compound V:	0.02, 0.02 (0.03)	30	
USA,	WG 12	2	0.034		straw			RR91-011B
Kearney (NE)					l-cyhalothrin:	0.48, 0.58 (0.53)	30	41-NE-88-657
						0.45	41	
1988					R157836:	0.05, 0.06 (0.06)	30	Francis, 1991
(Cody)						0.05	41	
					Compound Ia:	0.03, 0.03 (0.03)	30	
					Compound V:	0.01, 0.01 (0.01)	30	
USA,	WG 12	2	0.034		straw			RR91-011B
Bloomfield (MT)					l-cyhalothrin:	0.27	31	34-MR-88-658
						0.07	44	
1988					R157836:	0.02	31	Francis, 1991
(Olat)						< 0.01	44	
					Compound Ia:	0.03, 0.04 (0.04)	31	
					Compound V:	0.03, 0.03 (0.03)	31	
USA,	WG 12	2	0.034		straw			RR91-011B
Yuma (AZ)					l-cyhalothrin:	0.19	30	14-AZ-88-660
						0.35	45	
1988					R157836:	0.02	30	Francis, 1991
(Yecora Rojo)						0.03	45	
USA,	EC 12	2	0.034		straw			RR91-011B
Yuma (AZ)					l-cyhalothrin:	0.5, 0.38 (0.44)	30	14-AZ-88-660
						0.29	45	
1988					R157836:	0.05, 0.04 (0.05)	30	Francis, 1991
(Yecora Rojo)						0.02	45	
					Compound Ia:	0.04	30	
					Compound V:	0.06	30	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	WG	2	0.034		straw			RR91-011B
Chico (CA)	12				l-cyhalothrin:	0.86	20	20-CA-88-663
						1.1, 0.74 (0.92)	34	
1988					R157836:	0.06	20	Francis, 1991
(Yolo)						0.09, 0.04 (0.07)	34	
					Compound Ia:	0.08	20	
						0.08	34	
					Compound V:	0.09	20	
						0.08	34	
USA,	WG	2	0.034		straw			RR91-011B
Stockton (CA)	12				l-cyhalothrin:	0.19	30	17-CA-88-664
						0.17	44	
1988					R157836:	< 0.01	30	Francis, 1991
(Yecora Rojo)						< 0.01	44	
USA,	EC 12	2	0.034		straw			RR91-011B
Stockton (CA)					l-cyhalothrin:	0.36	30	17-CA-88-664
						0.25	44	
1988					R157836:	0.02	30	Francis, 1991
(Yecora Rojo)						0.02	44	
					Compound Ia:	0.03, 0.04 (0.04)	30	
					Compound V:	0.02, 0.03 (0.03)	30	
USA,	WG	2	0.034		straw			RR91-011B
Enterprise (AL)	12				l-cyhalothrin:	0.7	29	44-AL-88-665
						0.01	44	
1988					R157836:	0.12	29	Francis, 1991
(Florida 302)						< 0.01	44	
USA,	EC 12	2	0.034		straw			RR91-011B
Enterprise (AL)					l-cyhalothrin:	0.7	29	44-AL-88-665
						0.11	44	
1988					R157836:	0.11	29	Francis, 1991
(Florida 302)						0.02	44	
USA,	WG	2	0.034		straw			RR91-011B
Pullman (WA)	12				l-cyhalothrin:	0.29	34	15-WA-88-666
						0.17, 0.16 (0.17)	47	
1988					R157836:	0.03	34	Francis, 1991
(Hill 81 Soft White)						0.02, 0.02 (0.02)	47	
USA,	EC 12	2	0.034		straw			RR91-011B
Pullman (WA)					l-cyhalothrin:	0.33	34	15-WA-88-666
						0.26	47	
1988					R157836:	0.04	34	Francis, 1991
(Hill 81 Soft White)						0.03	47	
					Compound Ia:	0.02	34	
					Compound V:	0.02	34	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	WG	2	0.034		straw			RR91-011B
Columbia (LA)	12				l-cyhalothrin:	0.52	27	51-LA-88-667
						0.3	45	
1988					R157836:	0.06	27	Francis, 1991
(Florida 302)						0.05	45	
USA,	EC 12	2	0.034		straw			RR91-011B
Columbia (LA)					l-cyhalothrin:	1.2, 1.4 (1.3)	30	51-LA-88-667
						0.63	45	
1988					R157836:	0.19, 0.22 (0.21)	30	Francis, 1991
(Florida 302)						0.11	45	
					Compound Ia:	0.19	30	
					Compound V:	0.07	30	
USA,	WG	2	0.034		straw			RR91-011B
Heartland (IN)	12				l-cyhalothrin:	0.35	30	24-IN-88-668
						0.22	45	
1988					R157836:	0.07	30	Francis, 1991
(Cladwell)						0.04	45	
USA,	EC 12	2	0.034		straw			RR91-011B
Heartland (IN)					l-cyhalothrin:	0.5	30	24-IN-88-668
						0.27	45	
1988					R157836:	0.08	30	Francis, 1991
(Cladwell)						0.04	45	
USA,	WG	2	0.034		straw			RR91-011B
Yuma (AZ)	12				l-cyhalothrin:	0.21	30	14-AZ-88-669
						0.3	45	
1988					R157836:	0.01	30	Francis, 1991
(not reported)						0.04	45	
USA,	EC 12	2	0.034		straw			RR91-011B
Yuma (AZ)					l-cyhalothrin:	0.2	30	14-AZ-88-669
						0.23	45	
1988					R157836:	0.01	30	Francis, 1991
(not reported)						0.02	45	
USA,	EC 12	2	0.034		straw			RR91-011B
Paynesville (MN)					l-cyhalothrin:	0.24	30	33-MN-89-671
					R157836:	0.03	30	
1989					Compound Ia:	0.03	30	Francis, 1991
(Marshall)					Compound V:	0.02	30	
USA,	EC 12	2	0.034		straw			RR91-011B
Jerome (ID)					l-cyhalothrin:	0.22, 0.19 (0.21)	30	16-ID-89-672
					R157836:	0.02, 0.02 (0.02)	30	
1989					Compound Ia:	0.03	30	Francis, 1991
(not reported)					Compound V:	0.02	30	
USA,	EC 12	2	0.034		straw			RR91-011B
Washbury (ND)					l-cyhalothrin:	0.47	30	34-ND-89-673
					R157836:	0.04	30	
1989					Compound Ia:	0.07, 0.08 (0.08)	30	Francis, 1991
(Pioneer 2375)					Compound V:	0.05, 0.06 (0.06)	30	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	2	0.034		straw			RR91-011B
Volga (SD)					Compound Ia:	0.01	30	31-SD-89-674
					Compound V:	0.01	30	
1989								Francis, 1991
(Gaurd)								
USA,	EC 12	2	0.034		straw			RR91-011B
Washbury (ND)					l-cyhalothrin:	0.84	30	34-ND-89-675
					R157836:	0.14	30	
1989					Compound Ia:	0.06	30	Francis, 1991
(Pioneer 2375)					Compound V:	0.05	30	
Germany,	EC 5	3	0.01	0.0025	straw	0.26	52	M4011B,
Bad Bergzabern								RS 8416 E1
1984								Sapiets, 1985d
(Turbo)								
Germany,	EC 5	3	0.01	0.0025	straw	0.21	51	M4011B,
Varendorf						0.34	67	RS 8417 E2
						0.13	73	
1984								Sapiets, 1985d
(Okapi)								
Germany,	EC 5	3	0.01	0.0025	straw	0.11	47	M4146B,
Moelln								RS 8516 B1
1985								Ruskin, 1986
(Kanzler)								
Germany,	EC 5	3	0.01	0.0025	straw	0.34	46	M4146B,
Kapellen-Drusweiler						0.42	60	RS 8517 B1
						0.26	67	
1985								Ruskin, 1986
(Grandur)								
Germany,	EC 5	3	0.01	0.0025	straw	0.07	30	M4146B,
Varendorf						0.09	42	RS 8517 B1
						0.1	60	
1985								Ruskin, 1986
(Selpek)								
Germany,	EC 5	3	0.01	0.0025	straw	0.2	42	RJ1464B,
Kapellen-Drusweiler								RS-9211-E1
1992								Ryan, 1993
(Ambral)								
Germany,	WG 5	3	0.01	0.0025	straw	0.16	42	RJ1464B,
Kapellen-Drusweiler								RS-9211-E1
1992								Ryan, 1993
(Ambral)								

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Kleindroeben	EC 5	3	0.01	0.0025	straw	0.41	41	RJ1464B, RS-9211-I2
1992 (Borenos)								Ryan, 1993
Germany, Kleindroeben	WG 5	3	0.01	0.0025	straw	0.61	41	RJ1464B, RS-9211-I2
1992 (Borenos)								Ryan, 1993

R157836 = epimer of lambda-cyhalothrin

Table 112 Lambda-cyhalothrin residues in barley straw following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South), Renneville	EC 5	2	0.01	0.005	straw	0.51	21	17915 AF/4150/IV/1
1998 (Nevada)								Old, 1999d
France (South) Aucamville	EC 5	2	0.01	0.005	straw	0.48	21	17915 AF/4150/IV/2
1998 (Kelibia)								Old, 1999d
Spain, Villanueva de los Infantes	EC 5	2	0.01	0.005	straw	0.35	14	17915 AF/4150/IV/3
1998 (Caballar)								Old, 1999d
Spain, El Bonillo	EC 5	2	0.01	0.005	straw	0.73	14	17915 AF/4150/IV/4
1998 (Cervecera)								Old, 1999d
France (South), Renneville	EC 5	2	0.02	0.01	straw	1.2	21	17915 AF/4150/IV/1
1998 (Nevada)								Old, 1999d

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
France (South) Aucamville	EC 5	2	0.02	0.01	straw	0.65	21	17915 AF/4150/IV/2
1998 (Kelibia)								Old, 1999d
Spain, Villanueva de los Infantes	EC 5	2	0.02	0.01	straw	0.73	14	17915 AF/4150/IV/3
1998 (Caballar)								Old, 1999d
Spain, El Bonillo	EC 5	2	0.02	0.01	straw	0.93	14	17915 AF/4150/IV/4
1998 (Cervecera)								Old, 1999d
France (South), Aucamville	EC 5	2	0.01	0.003	straw	0.42 0.4	14 21	AF74727/ZE, AF74727/ZE/1
1999 (Keliba)								Brereton, 2000b
France (South), Grazac	EC 5	2	0.01	0.003	straw	0.25 0.35	14 35	AF74727/ZE, AF74727/ZE/2
1999 (Gaelic)								Brereton, 2000b
Italy, Conselice	EC 5	2	0.01	0.003	straw	0.3	10	AF74727/ZE, AF74727/ZE/3
1999 (Sonora)								Brereton, 2000b
Italy, Crevalcore	EC 5	2	0.01	0.003	straw	0.3	9	AF74727/ZE, AF74727/ZE/4
1999 (Federal)								Brereton, 2000b
France (South), Aucamville	EC 5	2	0.02	0.007	straw	0.71 0.82	14 21	AF74727/ZE, AF74727/ZE/1
1999 (Keliba)								Brereton, 2000b
France (South), Grazac	EC 5	2	0.02	0.007	straw	0.44 0.44	14 35	AF74727/ZE, AF74727/ZE/2
1999 (Gaelic)								Brereton, 2000b

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Italy, Conselice	EC 5	2	0.02	0.007	straw	0.53	10	AF74727/ZE, AF74727/ZE/3
1999 (Sonora)								Brereton, 2000b
Italy, Crevalcore	EC 5	2	0.02	0.007	straw	0.59	9	AF74727/ZE, AF74727/ZE/4
1999 (Federal)								Brereton, 2000b
France (South), Montbrillais	CS 10	2	0.01	0.003	straw	0.18 0.19	25 32	AF/7308/SY, AF/7308/SY/1
2003 (Majestic)								Oxspring, 2004a
France (South), Castelnau-d'Estretefonds	CS 10	2	0.01	0.003	straw	0.15 0.3	17 25	AF/7308/SY, AF/7308/SY/2
2003 (Nevada)								Oxspring, 2004a
Italy, Quatro Inferiore	CS 10	2	0.01	0.003	straw	0.18 0.16	21 28	AF/7308/SY, AF/7308/SY/3
2003 (Federal)								Oxspring, 2004a
Italy, Castenaso	CS 10	2	0.01	0.003	straw	0.15 0.09	21 28	AF/7308/SY, AF/7308/SY/4
2003 (Nikel)								Oxspring, 2004a
France (South), Montbrillais	CS 10	2	0.02	0.007	straw	0.49 0.32	25 32	AF/7308/SY, AF/7308/SY/1
2003 (Majestic)								Oxspring, 2004a
France (South), Castelnau-d'Estretefonds	CS 10	2	0.02	0.007	straw	0.26 0.7	17 25	AF/7308/SY, AF/7308/SY/2
2003 (Nevada)								Oxspring, 2004a
Italy, Quatro Inferiore	CS 10	2	0.02	0.007	straw	0.35 0.28	21 28	AF/7308/SY, AF/7308/SY/3
2003 (Federal)								Oxspring, 2004a

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Italy, Castenaso	CS 10	2	0.02	0.007	straw	0.47 0.16	21 28	AF/7308/SY, AF/7308/SY/4
2003 (Nikel)								Oxspring, 2004a
France (South), St. Benigne	CS 10	2	0.01	0.003	straw	0.09	32	AF/8672/SY, AF/8672/SY/1 Plot 2
2005 (Verticale)								North, 2006f
France (South), St. Benigne	CS 10	2	0.01	0.003	straw	0.09	30	AF/8672/SY, AF/8672/SY/1 Plot 3
2005 (Verticale)								North, 2006f
France (South), St. Benigne	CS 10	2	0.01	0.003	straw	0.11	24	AF/8672/SY, AF/8672/SY/1 Plot 4
2005 (Verticale)								North, 2006f
France (South), St. Benigne	CS 10	2	0.01	0.003	straw	0.18	20	AF/8672/SY, AF/8672/SY/1 Plot 5
2005 (Verticale)								North, 2006f
France (South), St. Benigne	CS 10	2	0.01	0.003	straw	0.17	16	AF/8672/SY, AF/8672/SY/1 Plot 6
2005 (Verticale)								North, 2006f
France (South), St. Benigne	CS 10	2	0.01	0.003	straw	0.1 0.14	28 35	AF/8672/SY, AF/8672/SY/1 Plot 7
2005 (Verticale)								North, 2006f
Spain, Calatorao	CS 10	2	0.01	0.003	straw	0.11	45	AF/8672/SY, AF/8672/SY/2 Plot 2
2005 (Sultane)								North, 2006f
Spain, Calatorao	CS 10	2	0.01	0.003	straw	0.17	42	AF/8672/SY, AF/8672/SY/2 Plot 3
2005 (Sultane)								North, 2006f

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain, Calatorao 2005 (Sultane)	CS 10	2	0.01	0.003	straw	0.23	38	AF/8672/SY, AF/8672/SY/2 Plot 4 North, 2006f
Spain, Calatorao 2005 (Sultane)	CS 10	2	0.01	0.003	straw	0.25	35	AF/8672/SY, AF/8672/SY/2 Plot 5 North, 2006f
Spain, Calatorao 2005 (Sultane)	CS 10	2	0.01	0.003	straw	0.25	32	AF/8672/SY, AF/8672/SY/2 Plot 6 North, 2006f
Spain, Calatorao 2005 (Sultane)	CS 10	2	0.01	0.003	straw	0.23 0.3	28 35	AF/8672/SY, AF/8672/SY/2 Plot 7 North, 2006f
Spain, Villarreal de Huerva 2005 (Montage)	CS 10	2	0.01	0.003	straw	0.14	38	AF/8672/SY, AF/8672/SY/3 Plot 2 North, 2006f
Spain, Villarreal de Huerva 2005 (Montage)	CS 10	2	0.01	0.003	straw	0.06	38	AF/8672/SY, AF/8672/SY/3 Plot 3 North, 2006f
Spain, Villarreal de Huerva 2005 (Montage)	CS 10	2	0.01	0.003	straw	0.08	35	AF/8672/SY, AF/8672/SY/3 Plot 4 North, 2006f
Spain, Villarreal de Huerva 2005 (Montage)	CS 10	2	0.01	0.003	straw	0.11	32	AF/8672/SY, AF/8672/SY/3 Plot 5 North, 2006f
Spain, Villarreal de Huerva 2005 (Montage)	CS 10	2	0.01	0.003	straw	0.13	28	AF/8672/SY, AF/8672/SY/3 Plot 6 North, 2006f

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Spain, Villarreal de Huerva	CS 10	2	0.01	0.003	straw	0.12 0.31	28 35	AF/8672/SY, AF/8672/SY/3 Plot 7
2005 (Montage)								North, 2006f
Italy, Quarto Inferiore	CS 10	2	0.01	0.003	straw	0.15	35	AF/8672/SY, AF/8672/SY/4 Plot 2
2005 (Siberia)								North, 2006f
Italy, Quarto Inferiore	CS 10	2	0.01	0.003	straw	0.15	28	AF/8672/SY, AF/8672/SY/4 Plot 3
2005 (Siberia)								North, 2006f
Italy, Quarto Inferiore	CS 10	2	0.01	0.003	straw	0.21	24	AF/8672/SY, AF/8672/SY/4 Plot 4
2005 (Siberia)								North, 2006f
Italy, Quarto Inferiore	CS 10	2	0.01	0.003	straw	0.18	22	AF/8672/SY, AF/8672/SY/4 Plot 5
2005 (Siberia)								North, 2006f
Italy, Quarto Inferiore	CS 10	2	0.01	0.003	straw	0.26	15	AF/8672/SY, AF/8672/SY/4 Plot 6
2005 (Siberia)								North, 2006f
Italy, Quarto Inferiore	CS 10	2	0.01	0.003	straw	0.11 0.12	29 35	AF/8672/SY, AF/8672/SY/4 Plot 7
2005 (Siberia)								North, 2006f
Germany, Ratzeburg	EC 5	3	0.01	0.0025	straw	0.02	48	M4011B, RS 8416 B1
1984 (Tapir)								Sapiets, 1985d
Germany, Lueneburg	EC 5	3	0.01	0.0025	straw	0.41 0.24 0.29	33 47 62	M4011B, RS 8417 B2
1984 (Cerise)								Sapiets, 1985d

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Offenbach	EC 5	3	0.01	0.0025	straw	0.39 0.41 0.37	43 49 52	M4011B, RS 8417 E1
1984 (Trumpf)								Sapiets, 1985d
Germany, Lauenburg	EC 5	3	0.01	0.0025	straw	0.25 0.32 0.17	44 54 61	M4146B, RS 8517 B2
1985 (Mammut)								Ruskin, 1986
Germany, Celle	EC 5	3	0.01	0.0025	straw	0.43 0.32 0.02	30 42 60	M4146B, RS 8517 B4
1985 (Harry)								Ruskin, 1986
Germany, Dabrun-Melzwig	EC 5	3	0.01	0.0025	straw	0.25	34	RJ1464B, RS-9211-I1
1992 (Nixe)								Ryan, 1993
Germany, Dabrun-Melzwig	WG 5	3	0.01	0.0025	straw	0.34	34	RJ1464B, RS-9211-I1
1992 (Nixe)								Ryan, 1993
Germany, Rade	WG 2	3	0.005	0.001	straw	0.05	35	RJ1818B, RS-9430-K1
1994 (Teo)								Robinson, 1995
Germany, Rade	WG 5	3	0.0075	0.002	straw	0.15	35	RJ1818B, RS-9430-K1
1994 (Teo)								Robinson, 1995

Table 113 Lambda-cyhalothrin residues in oats straw following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Wernersberg	EC 5	3	0.01	0.0025	straw	0.09 0.23 0.25	31 56 65	M4011B, RS 8417 E2
1984 (Alfred)								Sapiets, 1985d

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Wernersberg	EC 5	3	0.01	0.0025	straw	0.15	44	M4146B, RS 8516 E1
1985 (Cambo)								Ruskin, 1986
Germany, Ziethen	EC 5	3	0.01	0.0025	straw	0.06	36	RJ1464B, RS-9211-B1
1992 (Alfred)								Ryan, 1993
Germany, Ziethen	WG 5	3	0.01	0.0025	straw	0.04	36	RJ1464B, RS-9211-B1
1992 (Alfred)								Ryan, 1993
Germany, Gehmen	WG 2	3	0.005	0.001	straw	0.01	35	RJ1818B, RS-9430-K2
1994 (Salomon)								Robinson, 1995
Germany, Gehmen	WG 5	3	0.0075	0.002	straw	0.06	35	RJ1818B, RS-9430-K2
1994 (Salomon)								Robinson, 1995

Table 114 Lambda-cyhalothrin residues in rye straw following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Ratzeburg	EC 5	3	0.01	0.0025	grain	0.14 0.18 0.13	68 74 84	M4011B, RS 8417 B1
1984 (Halo)								Sapiets, 1985d
Germany, Ratzeburg	EC 5	3	0.01	0.0025	straw	0.14 0.06 0.02	69 80 88	M4146B, RS 8517 B1
1985 (Pekuro)								Ruskin, 1986
Germany, Varendorf	WG 2	3	0.005	0.001	straw	0.04	41	RJ1818B, RS-9430-B1
1994 (Marder)								Robinson, 1995

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Varendorf	WG 5	3	0.0075	0.002	straw	0.1	41	RJ1818B, RS-9430-B1
1994 (Marder)								Robinson, 1995

Table 115 Lambda-cyhalothrin residues in triticale straw following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
Germany, Inchenhofen	WG 2	3	0.005	0.001	straw	0.04	33	RJ1818B,
						0.05	38	RS-9430-G1
1994 (Modus)								Robinson, 1995
Germany, Inchenhofen	WG 5	3	0.0075	0.002	straw	0.04	33	RJ1818B,
						0.06	38	RS-9430-G1
1994 (Modus)								Robinson, 1995

Table 116 Lambda-cyhalothrin residues in rice straw following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA, Shoffner (AR)	EC 12	4	0.045	0.005	straw			RR96-056B,
					l-cyhalothrin:	1.2	21	49-AR-95-281
						1.4	21	
1995 (Kaybonnet)					R157836:	0.1	21	Roper, 1996
						0.14	21	
USA, Proctor (AR)	EC 12	4	0.045	0.003	straw			RR96-056B,
					l-cyhalothrin:	1.2	21	49-AR-95-282
						1.2	21	
1995 (Newbonney)					R157836:	0.16	21	Roper, 1996
						0.16	21	
USA, Stuttgart (AR)	EC 12	4	0.045	0.005	straw			RR96-056B,
			0.045	0.005	l-cyhalothrin:	0.52	20	49-AR-95-283
			0.045	0.004		0.47, 0.46 (0.47)	20	
1995 (Lemont)			0.045	0.004	R157836:	0.03	20	Roper, 1996
						0.03	20	
USA, Keiser (AR)	EC 12	4	0.045	0.005	straw			RR96-056B,
			0.045	0.004	l-cyhalothrin:	0.49	21	49-AR-95-284
			0.045	0.005		0.41	21	
1995			0.045	0.005	R157836:	0.13	21	Roper, 1996

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
(Kaybonnet)						0.03	21	
USA,	EC 12	4	0.045	0.005	straw			RR96-056B,
Lodge Corner (AR)			0.045	0.004	l-cyhalothrin:	0.34	21	49-AR-95-285
			0.045	0.005		0.65	21	
1995			0.045	0.005	R157836:	0.02	21	Roper, 1996
(Lemont)						0.04	21	
USA,	EC 12	4	0.045	0.005	straw			RR96-056B,
Georgetown (AR)					l-cyhalothrin:	0.42	21	49-AR-95-286
						0.36	21	
1995					R157836:	0.04	21	Roper, 1996
(Cypress)						0.04	21	
USA,	EC 12	4	0.045	0.003	straw			RR96-056B,
Rosa (AR)					l-cyhalothrin:	0.34	21	69-LA-95-287
						0.45	21	
1995					R157836:	0.03	21	Roper, 1996
(Lemont)						0.04	21	
USA,	EC 12	4	0.045	0.003	straw			RR96-056B,
Winnsboro (LA)			0.045	0.003	l-cyhalothrin:	0.23	21	69-LA-95-288
			0.045	0.005		0.22	21	
1995			0.045	0.005	R157836:	0.02	21	Roper, 1996
(Cypress)						0.02	21	
USA,	EC 12	4	0.045	0.002	straw			RR96-056B,
St. Joseph (LA)			0.045	0.003	l-cyhalothrin:	0.15	21	69-LA-95-289
			0.045	0.005		0.15	21	
1995			0.045	0.005	R157836:	0.03	21	Roper, 1996
(Cypress)						0.03	21	
USA,	EC 12	4	0.045	0.003	straw			RR96-056B,
Steele (MO)					l-cyhalothrin:	0.22	21	50-MO-95-290
						0.19	21	
1995					R157836:	0.04	21	Roper, 1996
(Allen)						0.03	21	
USA,	EC 12	4	0.045	0.005	straw			RR96-056B,
Leland (MS)			0.045	0.003	l-cyhalothrin:	1.1	7	05-MS-95-291
			0.045	0.005		0.54	14	
1995			0.045	0.005		0.49	21	Roper, 1996
(Lamont)						0.36	28	
					R157836:	0.14	7	
						0.07	14	
						0.06	21	
						0.05	28	
USA,	EC 12	4	0.045	0.004	straw			RR96-056B,
Greenville (MS)			0.045	0.002	l-cyhalothrin:	0.23	21	71-MS-95-292
			0.045	0.005		0.2	21	
1995			0.045	0.005	R157836:	0.01	21	Roper, 1996
(Lemont)						< 0.01	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.045	0.003	straw			RR96-056B,
Pattison (TX)					l-cyhalothrin:	0.41	21	25-TX-95-293
						0.43	21	
1995					R157836:	0.04	21	Roper, 1996
(Cypress)						0.04	21	
USA,	EC 12	4	0.045	0.005	straw			RR96-056B,
Louise (TX)			0.045	0.004	l-cyhalothrin:	1.4	21	25-TX-95-294
			0.045	0.005		0.81	21	
1995			0.045	0.005	R157836:	0.22	21	Roper, 1996
(Cypress)						0.12	21	
USA,	EC 12	4	0.045	0.005	straw			RR96-056B,
Richvale (CA)					l-cyhalothrin:	0.85	21	17-CA-95-295
						0.65	21	
1995					R157836:	0.09	21	Roper, 1996
(M-202)						0.06	21	
USA,	EC 12	4	0.045	0.005	straw			RR96-056B,
Biggs (CA)					l-cyhalothrin:	1.2	7	17-CA-95-296
						1.0	14	
1995						0.87	21	Roper, 1996
(M-103)						0.83, 0.91 (0.87)	28	
					R157836:	0.14	7	
						0.12	14	
						0.11	21	
						0.27, 0.42 (0.35)	28	

R157836 = epimer of lambda-cyhalothrin

Table 117 Lambda-cyhalothrin residues in almond hulls following foliar application

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	CS 12	4	0.045	0.015	hulls			RR99-032B,
Visalia (CA)					l-cyhalothrin:	0.38	13	02-CA-98-801
						0.3, 0.29, 0.3 (0.3)	13	
1998					R157836:	0.03	13	Miller, 1999
(Thompson)						0.02, 0.02, 0.02 (0.02)	13	
USA,	CS 12	4	0.045	0.01	hulls			RR99-032B,
Chico (CA)					l-cyhalothrin:	0.29	14	17-CA-98-802
						0.34	14	
1998					R157836:	0.02	14	Miller, 1999
(Non Pareil)						0.03	14	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	CS 12	4	0.045	0.01	hulls			RR99-032B,
Dunnigan (CA)					l-cyhalothrin:	0.28	14	17-CA-98-803
						0.29, 0.29 (0.29)	14	
1998					R157836:	0.03	14	Miller, 1999
(Mission)						0.03, 0.03 (0.03)	14	
USA,	CS 12	4	0.045	0.015	hulls			RR99-032B,
Esparto (CA)			0.045	0.002	l-cyhalothrin:	0.45	14	30-CA-98-804
			0.045	0.002		0.49	14	
1998			0.045	0.002	R157836:	0.04	14	Miller, 1999
(Carmel)						0.04	14	
USA,	CS 12	4	0.045	0.01	hulls			RR99-032B,
Hughson (CA)			0.045	0.002	l-cyhalothrin:	0.91	14	30-CA-98-805
			0.045	0.002		0.9, 1.1 (1.0)	14	
1998			0.045	0.002	R157836:	0.08	14	Miller, 1999
(Carmel)						0.07, 0.08 (0.08)	14	

R157836 = epimer of lambda-cyhalothrin

Table 118 Lambda-cyhalothrin residues in sunflower forage following foliar application (ground)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	1	0.034	0.03	forage			RR91-054B,
Washburn (ND)					l-cyhalothrin:	< 0.01	39	34-ND-88-777
					R157836:	< 0.01	39	
1988								
(Pioneer 6440)		1 [b]	0.034	0.03	forage			Francis, 1994
					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	39	
					R157836:	< 0.01, < 0.01 (< 0.01)	39	
USA,	EC 12	1	0.034	0.02	forage			RR91-054B,
Sioux Falls (SD)					l-cyhalothrin:	< 0.01	50	11-SD-88-778
					R157836:	< 0.01	50	
1988								Francis, 1994
(Interstate 893)		1 [b]	0.034	0.02	forage			
					l-cyhalothrin:	< 0.01	50	
					R157836:	< 0.01	50	
					Compound Ia:	< 0.01	50	
					Compound V:	< 0.01	50	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA, Glyndon (MN)	EC 12	1	0.034	0.018	forage			RR91-054B, 33-MN-88-779
					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	42	
1988 (NK285)					R157836:	< 0.01, < 0.01 (< 0.01)	42	Francis, 1994
		1 [b]	0.034	0.018				
					forage			
					l-cyhalothrin:	< 0.01	42	
					R157836:	< 0.01	42	
					Compound Ia:	< 0.01	42	
					Compound V:	< 0.01	42	
USA, Petersburg (TX)	EC 12	2	0.034	0.024	forage			RR91-054B, 13-TX-88-780
					l-cyhalothrin:	0.71	2	
					R157836:	0.08	2	
1988 (Tall Grey Stripe)								Francis, 1994
		2 [b]	0.034	0.024	forage			
					l-cyhalothrin:	0.96	2	
					R157836:	0.1	2	
					Compound Ia:	0.11, 0.11 (0.11)	2	
					Compound V:	0.03, 0.04 (0.04)	2	
USA, Ft. Collins	EC 12	3	0.034	0.024	forage			RR91-054B, 39-CO-88-782
					l-cyhalothrin:	0.05, 0.05 (0.05)	45	
					R157836:	< 0.01, < 0.01 (< 0.01)	45	
1988 (not reported)								Francis, 1994
		4 [a]	0.034	0.024				
					forage			
					l-cyhalothrin:	0.04	45	
					R157836:	< 0.01	45	
					Compound Ia:	0.03	45	
					Compound V:	0.01	45	
USA, Hughson (CA)	EC 12	1	0.034	0.03	forage			RR91-054B, 18-CA-88-783
					l-cyhalothrin:	< 0.01	30	
					R157836:	< 0.01	30	
1988 (SF-100)								Francis, 1994
		1 [b]	0.034	0.03	forage			
					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	30	
					R157836:	< 0.01, < 0.01 (< 0.01)	30	

R157836 = epimer of lambda-cyhalothrin

a one additional application before the last treatment

b replicate plot

Table 119 Lambda-cyhalothrin residues in sunflower forage following foliar application (aerial)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	1	0.034	0.17	forage			RR91-054B,
Washburn (ND)					l-cyhalothrin:	< 0.01	28	34-ND-90-715
					R157836:	< 0.01	28	
1990								Francis, 1994
(Pioneer 6440)								
USA,	EC 12	1	0.034	0.17	forage			RR91-054B,
Heckville (TX)					l-cyhalothrin:	< 0.01, < 0.01 (< 0.01)	26	13-TX-90-716
1990					R157836:	< 0.01, < 0.01 (< 0.01)	26	Francis, 1994
(Sigco 954)								

R157836 = epimer of lambda-cyhalothrin

Table 120 Lambda-cyhalothrin residues in peanut hulls following foliar application (ground)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.035	hulls			RR90-420B,
Statesboro (GA)					l-cyhalothrin:	< 0.02	0	83-GA-87-618
						< 0.02	14	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florunner)						< 0.02	14	
					Compound Ia:	< 0.01	0	
						< 0.01	14	
					Compound V:	< 0.01	0	
						< 0.01	14	
USA,	EC 12	4	0.034	0.015	hulls			RR90-420B,
Waller (TX)					l-cyhalothrin:	< 0.02	0	99-TX-87-619
						< 0.02	17	
1987					R157836:	< 0.02	0	McKay, 1991a
(Pronto Spanish)						< 0.02	17	
					Compound Ia:	< 0.01	0	
						< 0.01	17	
					Compound V:	< 0.01	0	
						< 0.01	17	
USA,	EC 12	4	0.034	0.04	hulls			RR90-420B,
Enterprise (AL)					l-cyhalothrin:	< 0.02	0	62-AL-87-620
						< 0.02	21	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florunner)						< 0.02	21	
					Compound Ia:	< 0.01	0	
						< 0.01	21	
					Compound V:	< 0.01	0	
						< 0.01	21	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.04	hulls			RR90-420B,
Enterprise (AL)					l-cyhalothrin:	< 0.02	0	62-AL-87-620P
						< 0.02	21	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florunner)						< 0.02	21	
					Compound Ia:	< 0.01	0	REPLICATE
						0.01	21	
					Compound V:	< 0.01	0	
						< 0.01	21	
USA,	EC 12	4	0.034	0.018	hulls			RR90-420B,
Pikeville (NC)					l-cyhalothrin:	< 0.02	0	US01-87-621
						< 0.02	20	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florigiant)						< 0.02	20	
USA,	EC 12	4	0.034	0.018	hulls			RR90-420B,
Pikeville (NC)					l-cyhalothrin:	< 0.02	0	US01-87-621P
						0.06	20	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florigiant)						< 0.02	20	
					Compound Ia:	< 0.01	0	REPLICATE
						< 0.01	20	
					Compound V:	< 0.01	0	
						< 0.01	20	
USA,	EC 12	4	0.034	0.013	hulls			RR90-420B,
Whaleyville (VA)					l-cyhalothrin:	< 0.02	0	61-VA-87-622
						< 0.02	14	
1987					R157836:	< 0.02	0	McKay, 1991a
(NC7)						< 0.02	14	
USA,	EC 12	4	0.034	0.024	hulls			RR90-420B,
Eakly (OK)					l-cyhalothrin:	< 0.02	0	72-OK-87-623
						< 0.02	28	
1987					R157836:	< 0.02	0	McKay, 1991a
(Spanco)						< 0.02	28	
USA,	EC 12	4	0.034	0.016	hulls			RR90-420B,
Newberry (FL)					l-cyhalothrin:	< 0.02	0	75-FL-87-624
						< 0.02	17	
1987					R157836:	< 0.02	0	McKay, 1991a
(Sun Runner)						< 0.02	17	
					Compound Ia:	< 0.01	0	
						< 0.01	17	
					Compound V:	< 0.01	0	
						< 0.01	17	
USA,	EC 12	4	0.034	0.035	hulls			RR90-420B,
Cochran (GA)					l-cyhalothrin:	< 0.02	0	83-GA-87-625
						< 0.02	14	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florunner)						< 0.02	14	

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.013	hulls			RR90-420B,
Banks (AL)					l-cyhalothrin:	< 0.02	0	62-AL-87-626
						< 0.02	13	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florunner)						< 0.02	13	

R157836 = epimer of lambda-cyhalothrin

Table 121 Lambda-cyhalothrin residues in peanut hulls following foliar application (aerial)

Location, Year (variety)	Form, % ai	Application data			Residues data			Reference (Report /Trial No., Author)
		No.	kg ai/ha	kg ai/hL	Sample	Residues [mg/kg]	PHI [days]	
USA,	EC 12	4	0.034	0.1	hulls			RR90-420B,
Cochran					l-cyhalothrin:	< 0.02	0	83-GA-87-627
						< 0.02	14	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florunner)						< 0.02	14	
USA,	EC 12	4	0.034	0.12	hulls			RR90-420B,
Farwell (TX)					l-cyhalothrin:	< 0.02	0	72-TX-87-628
						< 0.02	25	
1987					R157836:	< 0.02	0	McKay, 1991a
(Valencia McRan)						< 0.02	25	
					Compound Ia:	< 0.01	0	
						< 0.01	25	
					Compound V:	< 0.01	0	
						< 0.01	25	
USA,	EC 12	4	0.034	0.35	hulls			RR90-420B,
Goldsboro (NC)					l-cyhalothrin:	< 0.02	0	61-NC-87-630
						< 0.02	16	
1987					R157836:	< 0.02	0	McKay, 1991a
(Florigiant)						< 0.02	16	
					Compound Ia:	< 0.01	0	
						< 0.01	16	
					Compound V:	< 0.01	0	
						< 0.01	16	

R157836 = epimer of lambda-cyhalothrin

FATE OF RESIDUES IN STORAGE AND PROCESSING

In processing

The Meeting received information on the fate of lambda-cyhalothrin residues during processing of oranges, apples, peaches, plums, strawberries, currants, grapes, olives, tomatoes, spinach, beans, wheat, sorghum, rice sugarcane, soya beans and cotton seeds. Information was also provided on hydrolysis studies of lambda-cyhalothrin to assist with identification of the nature of the residue during processing.

Processing factors have been calculated for lambda-cyhalothrin residues and are presented in Table 122.

Hydrolysis of lambda-cyhalothrin was investigated by Richardson (2006), see the Physical/Chemical properties section of this evaluation. [Phenyl-^{14}C]- and [Cyclopropane-^{14}C]lambda-cyhalothrin were stable at pH 4 and 5. At pH 6 cleavage of the parent molecule was observed resulting in the primary breakdown products compounds IV and Ia..

Brereton (2000a) treated oranges with lambda-cyhalothrin at a rate of 2 g ai/hL in two supervised residue trials in Spain. Samples of fruit were taken 8 days after the final application and processed into juice and marmalade. For juicing the fruit were cut in half and placed on a juice extractor with the resulting juice then pasteurised. For the preparation of marmalade the zests of the fruit was removed and cooked with the peeled oranges. After cooking, sugar was added and the pH adjusted to 3.5 with citric acid. The marmalade was then sterilised. Residue trial data are summarised in Table 46. The resulting processing factors are presented in Table 122.

For apples the supervised residue trials were conducted in Spain and the United States by Goodband, 2001d and Spillner 1999b. The application rates were 1.8 g ai/hL and 1 g ai/hL respectively. Samples of fruit were collected 7 to 21 days after the final application and processed into juice and puree. After washing, the fruits were crushed by a hammer mill, heated and an enzyme added to the apple pulp. After setting the pulp was pressed and the juice was collected. From one trial processing factors could not be derived due to residues below the LOQ in the raw agricultural commodity. Residue trial data are summarised in Table 47. The resulting processing factors are presented in Table 122.

Goodband (2001) and Anthony (2000) reported three supervised trials on peaches conducted in southern France (see Table 50). Lambda-cyhalothrin was applied at rates of 3–6 g ai/hL using a CS 10 formulation. Samples of fruit were taken after 7 days for processing into juice, puree, jam puree and canned fruit. For the preparation of jam, the fruit were first peeled and had their stones removed. The fruit flesh was then crushed into pulp, sugar was added and the mixture was cooked and then sterilised. Canned peaches were first peeled, cut in halves and had their stones removed. The fruit pieces were put into jars, syrup was added and the mixture sterilised. The juicing of peaches was conducted by using an automatic sieve to separate the juice from peel, after removal of the stones. The juice was pasteurised at 82–85 °C. Puree was prepared in a comparable way. After the separation of the peel, sugar was added to the pulp and the mixture was reduced and. the puree sterilised. The resulting processing factors are presented in Table 122.

Residues, during processing of plums, were investigated by Goodband (2002g) in two field trials in southern France. Plum trees were treated twice with application rates of 2.5 g ai/hL (see Table 51). Samples for processing were taken 7 days after the last treatment and processed into jam, canned fruits and juice. For the preparation of plum jam the stones were removed. The plums were crushed, sugar added, the mixture was heated and then sterilised. Canned plums were prepared by adding syrup and then pasteurised. For juicing the unstoned fruits were crushed and separated from the peel and then pasteurised. From one trial processing factors could not be derived due to residues being below the LOQ in the raw agricultural commodity. The resulting processing factors are presented in Table 122.

For strawberries Goodband (2002d) investigated the behaviour during processing in two supervised residue trials in southern France (see Table 56). Lambda-cyhalothrin was applied twice at application rates of 0.025 kg ai/ha, using a CS 10 formulation. The fruit were harvested 3 days after the final treatment and processed into juice, jam and canned fruit. The resulting processing factors are presented in Table 122.

Ryan (2004a) reported two supervised residue trials for the processing of currants conducted in northern France. The plants were treated with twice at rates of 0.023–0.026 kg ai/ha. Samples were taken 7 days after the last application and processed into juice, jam, jelly and canned fruit. The resulting processing factors are presented in Table 122.

Grapes were investigated in 2000 and 2001 by Clarke (2002) and Greig (2004) in six supervised residue trials in southern Europe (see Table 54). Lambda-cyhalothrin was applied in a CS 10 formulation either once or twice with application rates of 0.02 kg ai/ha each. In two trials conducted in 2000 samples were taken 7 days after the final application. In 2001 four trials were designed as a reverse decline study with sample taken at PHIs ranging from 98 to 6 days. The sampled grape bunches were processed into must, red and white wine, juice and raisins. The resulting processing factors are presented in Table 122.

For olives Brereton (2001) conducted one supervised residue trial in Spain in 1999/2000 (Table 57). Olive trees were treated twice at an application rate of 0.002 kg ai/hL. Samples were taken 8 days after the last treatment and processed into virgin and refined oil. Refining of the oil was simulated by adding soda solution and treating the mix at 60–70 °C for 30 minutes. The resulting processing factors are presented in Table 122.

The processing of tomatoes was investigated by Gillespie (1990) in the United States. One supervised residue trial was conducted in Florida using 12 treatments with application rates of 0.034 to 0.17 kg ai/ha (see Table 69). Samples were taken 5 days after the last treatment and processed into juice, puree, ketchup and paste. The resulting processing factors are presented in Table 122.

Old (2002) conducted two supervised residue trials in northern France on spinach in 2001 (Table 63). Lambda-cyhalothrin was applied twice with application rates of 0.0075 kg ai/ha each. After 3 days samples for processing were collected, the leaves were separated from the stems and cooked. The resulting processing factors are presented in Table 122.

For green beans Old (2002a) investigated the residue behaviour during processing in two supervised residue trials in southern Europe (Table 71). The plant were treated with two applications of a CS 10 formulation at a rate of 0.025 kg ai/ha. Beans with pods were harvested 3 days after the final treatment and processed into blanched, cooked and canned beans. The resulting processing factors are presented in Table 122.

One supervised residue trial on wheat was conducted by McKay (1991b) in the United States (Table 87). Lambda-cyhalothrin was applied twice with a rate of 0.17 kg ai/ha. Mature grain was harvested 30 days after the final treatment and processed into bran, middlings and flour. After a mechanical cleaning of the grain the endosperm was removed in four breaks to gain the bran. The remainings were sieved to separate the low grade and the patent flour. The resulting processing factors are presented in Table 122.

For sorghum one supervised residue trial was reported by McKay (1991c) from the United States (see Table 89). Sorghum plants were treated four times at an application rate of 0.11 kg ai/ha. Samples were taken 30 days after the final treatment and processed into flour and starch. The resulting processing factors are presented in Table 122.

In the United States Roper (1991c) conducted one supervised residue trial for the processing of rice (see Table 89). The plant were treated four times at an application rate of 0.22 kg ai/ha. Mature rice grain was taken after 21 days and processed into polished rice and bran. The resulting processing factors are presented in Table 122.

Roper (1996d) investigated the residue behaviour of lambda-cyhalothrin in sugarcane in one supervised residue trial conducted in the United States (Table 92). The plant were treated four times with application rates of 0.22 kg ai/ha each. Samples were taken 21 days after the final treatment and processed into molasses, bagasse and refined sugar. The resulting processing factors are presented in Table 122.

For soya beans one supervised residue trial was conducted by McKay (1991d) in the United States. Lambda-cyhalothrin was applied twice at rates of 0.34 kg ai/ha (see Table 76). Dry seeds were collected at a PHI of 45 days and processed into meal as well as crude and refined oil. The crude oil was refined by NaOH, followed by decantation and filtration. The resulting processing factors are presented in Table 122.

Cottonseeds were treated by Neal (1985a) 15 times at application rates of up to 0.12 kg ai/ha in the United States (see Table 98). Cottonseed samples were harvested 23 days after the final treatment and processed into linters and meal as well as crude and refined oil. The resulting processing factors are presented in Table 122.

Table 122 Summary of processing factors for lambda-cyhalothrin in plant commodities

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors	Median or best estimate
Oranges	juice	< 0.14, < 0.33	< 0.33
	marmalade	< 0.33, 1	1
	wet pomace	1.6, 2	1.8
	dry pomace	3.9, 6.3	5.2
Apples	washed fruits	1	1
	peeled fruits	< 1	< 1
	peel	> 7, 8	7.8
	juice	< 0.01, < 1	< 1
	puree	< 1	< 1
	wet pomace	< 1, 8.1	8.1
	dry pomace	< 1	8.1 (see wet pomace)
Peaches	washed fruit	0.3, 0.67, 1, 1.2	0.8
	jam	< 0.1, < 0.2, < 0.33, < 0.5	< 0.28
	canned fruit	< 0.1, < 0.2, < 0.33, < 0.5	< 0.28
	juice (raw)	0.25, 0.67	0.46
	juice (bottled)	0.13, 0.33	0.23
	wet pomace	0.5, 2.7	1.6
	dry pomace	17, 18	18
	peeled peaches, canned	< 0.1, < 0.33	< 0.33
	peel	2.2, 6.8	4.5
	puree	0.2, 0.2	0.2
Plums	washed fruits	1	1
	jam	1	1
	canned fruits	< 0.5	< 0.5
	juice	< 0.5	< 0.5
	wet pomace	0.5	0.5
Strawberries	washed fruits	0.75, 1	0.88
	jam	0.4, 0.75	0.58
	canned fruits	0.8, 1.1	0.95
	wet pomace	2.3, 4.8	3.6
	juice	0.33, 0.4	0.37
Currants	washed fruits	0.83, 1	0.91
	jam	0.75, 0.92	0.84
	canned fruits	0.58, 0.67	0.63

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors	Median or best estimate
	juice, raw	0.33, 0.5	0.42
	juice, bottled	0.25, 0.42	0.34
	sieved pomace	1.4, 1.7	1.6
	jelly	0.33, 0.83	0.58
Grapes	raisins	3, 3	3
	must (white)	< 0.5	< 0.5
	must (red)	0.5	0.5
	wet pomace (white wine)	3.5	3.5
	wet pomace (red wine)	5.5	5.5
	dry pomace (white wine)	11	11
	dry pomace (red wine)	15	15
	young wine (white & red wine)	< 0.5, < 0.5	< 0.5
	6M wine (white & red wine)	< 0.5, < 0.5	< 0.5
	juice (white & red)	< 0.5, < 0.5	< 0.5
Olives	washed fruits	0.92, 1	0.96
	virgin oil	0.46, 1	0.73
	refined oil	< 0.33, 0.62	0.62
	cake	0.77, 1	0.89
Tomatoes	juice	0.06	0.06
	ketchup	0.22	0.22
	paste	0.31	0.31
	puree	0.25	0.25
	wet pomace	8.8	8.8
	dry pomace	56	56
Spinach	stalks and ribs	0.14, 0.14	0.14
	washed cut leaves	1.1, 1.2	1.2
	cooked leaves	1.6, 1.8	1.7
Beans (green)	washed snibbed beans	0.58, 0.75	0.67
	blanched cooked beans	0.11, 0.75	0.43
	canned beans	0.3, 0.5	0.4
	cooked beans	0.59, 1.0	0.8
Wheat	bran	4.5	4.5
	middlings	1.0	1.0
	shorts & germs	1.5	1.5
	low grade flour	0.5	0.5
	patent flour	0.5	0.5
	grain dust (> 2030µ)	4	4
	grain dust (< 420µ)	98	98

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors	Median or best estimate
Sorghum	flour	1	1
	starch	< 0.17	< 0.17
	dust	7	7
Rice	polished rice	< 0.01	< 0.01
	hulls	6.5	6.5
	bran	0.22	0.22
Sugarcane	molasses	< 0.05	< 0.05
	refined sugar	< 0.05	< 0.05
	bagasse	1.9	1.9
Soya bean	hulls	< 1	< 1
	meal	< 1	< 1
	crude oil	< 1	< 1
	refined oil	< 1	< 1
	soapstock	< 1	< 1
Cottonseed	delinted seed	0.1	0.1
	linters	3.8	3.8
	linter motes	4.7	4.7
	hulls	0.1	0.1
	meal	< 0.1	< 0.1
	crude oil	0.5	0.5
	refined oil	0.1	0.1
	soapstock	0.5	0.5

RESIDUES IN ANIMAL COMMODITIES

Farm animal feeding studies

For residues in farm animal two studies on lactating cows were submitted. No data was made available for poultry.

Cow feeding studies

The residue behaviour in lactating cows was investigated by Sapiets (1985e). Lactating Friesian dairy cows between four and nine years old were fed for up to 30 days on diets containing approximately 1, 5 and 25 mg/kg lambda-cyhalothrin. The lambda-cyhalothrin was incorporated into molasses, which was added to the concentrated feed at each of the twice-daily milking times. A control group was fed untreated diet. Each feeding group contained at least three cows; the 25 mg/kg group contained five cows, two of which were continued on untreated diet at the end of the four week treatment period. Milk samples were taken twice daily and the morning and afternoon production bulked for each cow. Tissue samples (muscle, liver, kidney and fat) were taken within 24 h of cessation of dosing except for the two cows allowed a two-week "recovery" period on untreated diet. All samples were analysed according to method RAM 086 (see analytical section), measuring lambda-cyhalothrin only.

At the lowest dose level no residues above the LOQ of 0.01 mg/kg were detected in meat. Liver and kidney gave small measurable residues at 0.03 mg/kg and 0.02 mg/kg respectively. The majority of the residue was found in fat, ranging up to 0.5 mg/kg.

In the 5 mg/kg dose group comparable results were obtained. Residues in muscle, liver and kidney were in the range of 0.01 to 0.07 mg/kg. In fatty tissues lambda-cyhalothrin accumulated to a level up to 1.8 mg/kg.

At the highest dose rate of 25 mg/kg residues were relatively high. Meat contained lambda-cyhalothrin resides up to 0.4 mg/kg. In liver lower residues compared to kidney were detected (0.08 mg/kg and 0.4 mg/kg respectively). Most of the residue was found in fat ranging from 1.3 up to 7.2 mg/kg. Tissues from the cows in the 25 mg/kg group that were allowed a recovery period on untreated diet contained significantly lower residues of < 0.01-0.05 mg/kg (meat), < 0.01 mg/kg (liver), 0.10–0.20 mg/kg (kidney) and 0.03–2.6 mg/kg (fat).

The results for milk and tissues are presented in Tables 123 and 124.

Table 123 Residues in milk of cows dosed with lambda-cyhalothrin at levels of 1, 5 and 25 ppm in the diet

Days Residues in mg/kg

	Control group			1 ppm group			5 ppm group			25 ppm group				
	1	2	3	4	5	6	7	8	9	10	11	12	13 [a]	14 [a]
-3	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
1	< 0.002	-	-	0.003	0.002	0.002	0.005	0.007	0.002	0.007	0.007	0.003	0.01	0.005
3	< 0.002	-	-	-	-	-	-	-	-	-	-	-	-	-
5	0.002	-	-	0.02	0.01	0.02	0.05	0.05	0.05	0.31	0.32	0.38	0.41	0.4
8	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-
10	0.003	-	-	0.02	0.03	0.02	0.09	0.12	0.07	0.51	0.47	0.48	0.54	0.47
12	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-
15	0.004	-	-	0.02	0.03	0.03	0.09	0.1	0.07	0.45	0.71	0.48	0.54	0.68
17	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-
21	0.006	-	-	0.03	0.03	0.01	0.14	0.05	0.06	0.38	0.51	0.73	0.68	0.43
24	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-
26	0.003	-	-	0.02	0.02	0.02	0.1	0.1	0.09	0.51	0.6	0.39	0.57	0.61
28	< 0.002	-	-	0.01	-	-	0.1	-	-	0.54	-	-	-	-
29	-	-	< 0.002	-	0.02	-	-	0.1	-	-	0.54	-	0.56	0.85
31	-	< 0.002	< 0.002	-	-	0.01	-	-	0.1	-	-	0.83	0.23	0.25
33	-	-	< 0.002	-	-	-	-	-	-	-	-	-	0.08	0.08
35	-	-	< 0.002	-	-	-	-	-	-	-	-	-	0.03	0.03
37	-	-	< 0.002	-	-	-	-	-	-	-	-	-	0.02	0.02
39	-	-	< 0.002	-	-	-	-	-	-	-	-	-	0.02	0.01
41	-	-	< 0.002	-	-	-	-	-	-	-	-	-	0.01	0.01
43	-	-	< 0.002	-	-	-	-	-	-	-	-	-	0.01	0.004
Max.	0.006			0.03			0.12			0.83				
AV.	0.006 (day 21)			0.03 (day 15)			0.1 (day 26)			0.57 (day 15)				
Milk	13.5 L/day			12.6 L/day			13.1 L/day			9.6 L/day				

a after 30 days allowed a 14 days recovery period on untreated diet

Max. maximum residue found in the dose group

AV highest average at one sampling day found in the dose group

The milk production is based on the average reported during the dosage period up to 28 days

Table 124 Residues in tissues of lactating cows dosed with lambda-cyhalothrin at levels of 1, 5 and 25 ppm in the diet

Dose rate	Cow	Residues in mg/kg					
		Muscle, adductor	Muscle, pectoral	Fat, subcutaneous	Fat, peritoneal	Liver	Kidney
Control	1	< 0.01	< 0.01, < 0.01 (< 0.01)	0.02, 0.02 (0.02)	0.07, 0.07 (0.07)	< 0.01, < 0.01 (< 0.01)	0.01, 0.01 (0.01)
	2	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)
	3	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	0.01, 0.01 (0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)
	Max.	< 0.01	< 0.01	0.02	0.07	< 0.01	0.01
	AV.	< 0.01	< 0.01	0.01	0.07	< 0.01	0.01
1 ppm	4	< 0.01	< 0.01, < 0.01 (< 0.01)	0.01, 0.01 (0.01)	0.07, 0.08 (0.08)	< 0.01, < 0.01 (< 0.01)	0.01, 0.02 (0.02)
	5	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	0.05	0.2, 0.19 (0.2)	0.02, 0.03 (0.03)	0.01, 0.01 (0.01)
	6	0.01, 0.01 (0.01)	0.01, 0.01 (0.01)	0.2, 0.21 (0.21)	0.46, 0.5 (0.48)	< 0.01, < 0.01 (< 0.01)	0.01, 0.01 (0.01)
	Max.	0.01	0.01	0.21	0.48	0.03	0.02
	AV.	0.01	0.01	0.09	0.25	0.03	0.01
5 ppm	7	0.03, 0.03 (0.03)	0.03, 0.04 (0.04)	0.47, 0.44 (0.46)	1.2, 1.2 (1.2)	0.01, 0.01 (0.01)	0.03, 0.05 (0.04)
	8	0.02, 0.01 (0.02)	0.07, 0.06 (0.07)	0.81, 0.8 (0.81)	1.7, 1.8 (1.8)	< 0.01, < 0.01 (< 0.01)	0.07, 0.07 (0.07)
	9	0.03, 0.03 (0.03)	0.04, 0.05 (0.05)	0.53, 0.45 (0.49)	1.0, 0.95 (0.98)	0.01, 0.01 (0.01)	0.02, 0.01 (0.02)
	Max.	0.03	0.07	0.81	1.8	0.01	0.07
	AV.	0.03	0.05	0.58	1.3	0.01	0.04
25 ppm	10	0.08, 0.12 (0.1)	0.02, 0.02 (0.02)	1.7, 1.3 (1.5)	4.0, 3.9 (4.0)	0.07, 0.06 (0.07)	0.09, 0.15 (0.12)
	11	0.11, 0.09 (0.1)	0.29, 0.29 (0.29)	1.3, 1.3 (1.3)	6.0, 5.7 (5.9)	0.06, 0.06 (0.06)	0.17, 0.19 (0.18)
	12	0.13, 0.14 (0.14)	0.41, 0.38 (0.40)	4.6, 3.9 (4.3)	7.9, 6.5 (7.2)	0.06, 0.1 (0.08)	0.36, 0.43 (0.4)
	Max.	0.14	0.40	4.3	7.2	0.08	0.4
	AV.	0.11	0.24	2.4	5.7	0.07	0.23
	13[a]	0.05, 0.05 (0.05)	0.03, 0.03 (0.03)	1.1, 1.0 (1.1)	2.4, 2.6 (2.5)	< 0.01, < 0.01 (< 0.01)	0.1, 0.16 (0.13)
	14	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	0.03	0.44, 0.47 (0.46)	< 0.01, < 0.01 (< 0.01)	0.18, 0.2 (0.19)

a after 30 days allowed a 14 days recovery period on untreated diet

Max. maximum residue found in the dose group

AV average of the dose group

In a second study by Eckstein (1992) lactating Holstein dairy cows between four and six years old were fed for 28 days on diets containing approximately 8, 25 and 60 mg/kg lambda-cyhalothrin (administered as gelatine capsules). A control group was fed untreated diet. Each feeding group contained at least four cows, of which one from each group was continued on untreated diet at the end of the four-week treatment period. Samples of liver and kidney were taken within 4 h of cessation of

dosing except for the four cows allowed a two-week "recovery" period on untreated diet. Analysis was conducted using method RAM 086/1 (see analytical section) measuring lambda-cyhalothrin as well as its epimer R157836 and the metabolites compound Ia and XI.

At the lowest dose group of 8 mg/kg lambda-cyhalothrin in the diet residues were relatively low (< 0.01–0.09 mg/kg for liver and 0.02–0.08 mg/kg in kidney). Over the whole dosage interval up to 60 mg/kg in the diet an increase in the residue up to 0.09 mg/kg in liver and 0.3 mg/kg in kidney was observed. Residues levels of compound Ia were comparable to lambda-cyhalothrin. The epimer R157836 and compound XI were found in lower levels. The results of the study are presented in Table 125.

Table 125 Lambda-cyhalothrin residues in liver and kidney after dosing with 8, 25 and 60 ppm in the diet

Dose rate	Cow	Residues in liver in mg/kg				Residues in kidney in mg/kg			
		lambda-cyhalothrin	R157836	Compound Ia	Compound XI	lambda-cyhalothrin	R157836	Compound Ia	Compound XI
Control	9	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01	< 0.01	< 0.01	< 0.01
	10	< 0.01	< 0.01	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01	< 0.01	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)
	13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)
	Max.	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	AV.	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	3[a]	< 0.01	< 0.01	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01	< 0.01
8 ppm	2	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	0.02, < 0.01 (0.02)	< 0.01, < 0.01 (< 0.01)	0.02, 0.02 (0.02)	< 0.01, < 0.01 (< 0.01)	0.02, 0.02 (0.02)	0.01, < 0.01 (0.01)
	4	0.02, 0.02 (0.02)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	0.01, 0.01 (0.01)	0.07, 0.04 (0.06)	0.01, < 0.01 (0.01)	< 0.01, 0.01 (0.01)	0.01, < 0.01 (0.01)
	12	0.05, 0.09, 0.05, 0.07, 0.02 (0.06)	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01 (< 0.01)	0.01, 0.01 (0.01)	0.01, 0.01 (0.01)	0.08, 0.04 (0.06)	0.01, < 0.01 (0.01)	0.01, 0.02 (0.02)	< 0.01, 0.01 (0.01)
	Max.	0.06	< 0.01	0.02	0.01	0.06	0.01	0.02	0.01
	AV.	0.03	< 0.01	0.01	0.01	0.05	0.01	0.02	0.01
	6[a]	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	0.02, 0.02 (0.02)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	0.01, < 0.01 (0.01)
25 ppm	5	0.03, 0.02 (0.03)	< 0.01, < 0.01 (< 0.01)	0.03, 0.04 (0.04)	0.02, 0.02 (0.02)	0.12, 0.08 (0.1)	< 0.01, < 0.01 (< 0.01)	0.07, 0.04, 0.04, 0.05 (0.05)	0.02, 0.02, 0.02, 0.01 (0.02)

Dose rate	Cow	Residues in liver in mg/kg				Residues in kidney in mg/kg			
		lambda-cyhalothrin	R157836	Compound Ia	Compound XI	lambda-cyhalothrin	R157836	Compound Ia	Compound XI
	14	0.01, < 0.01 (0.01)	< 0.01, < 0.01 (< 0.01)	0.03, 0.03 (0.03)	0.03, 0.02 (0.03)	0.02, 0.04 0.03 (0.03)	< 0.01, < 0.01, < 0.01 (< 0.01)	0.02, 0.02 (0.02)	0.02, 0.02 (0.02)
	15	0.05, 0.02, 0.01, 0.03, 0.02 (0.03)	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01 (< 0.01)	0.04, 0.06 (0.05)	0.04, 0.03 (0.04)	0.12, 0.11 (0.12)	< 0.01, 0.01 (0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)
	Max.	0.03	< 0.01	0.05	0.04	0.12	0.01	0.05	0.02
	AV.	0.02	< 0.01	0.04	0.03	0.08	0.01	0.03	0.02
	8[a]	< 0.01, 0.01 (0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)	0.05, 0.05 (0.05)	< 0.01, 0.01 (0.01)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)
60 ppm	7	0.04, 0.03 (0.04)	< 0.01, < 0.01 (< 0.01)	0.03, 0.09, 0.08, 0.07 (0.07)	0.03, 0.04, 0.06, 0.03 (0.04)	0.19, 0.2 (0.2)	0.03, 0.03 (0.03)	0.03, 0.03 (0.03)	0.01, < 0.01 (0.01)
	11	0.04, 0.06 (0.05)	< 0.01, 0.01 (0.01)	0.07, 0.11 (0.09)	0.05, 0.06 (0.06)	0.29, 0.3 (0.3)	0.04, 0.04 (0.04)	0.05, 0.06 (0.06)	0.02, 0.03 (0.03)
	16	0.09, 0.09 (0.09)	0.02, 0.02 (0.02)	0.12, 0.15, 0.13, 0.14, 0.13, 0.13, 0.14 (0.13)	0.07, 0.08, 0.08, 0.08, 0.08, 0.07, 0.07 (0.08)	0.24, 0.27 (0.26)	0.04, 0.04 (0.04)	0.09, 0.09, 0.07, 0.09, 0.08, 0.011, 0.1 (0.09)	0.03, 0.03, 0.03, 0.02, 0.04, 0.04, 0.05 (0.03)
	Max.	0.09	0.02	0.13	0.08	0.3	0.04	0.09	0.03
	AV.	0.06	0.01	0.1	0.06	0.25	0.04	0.06	0.02
	1[a]	0.04, 0.05 (0.05)	< 0.01, < 0.01 (< 0.01)	0.02, 0.01 (0.02)	< 0.01, < 0.01 (< 0.01)	0.17, 0.19 (0.18)	0.02, 0.03 (0.03)	< 0.01, < 0.01 (< 0.01)	< 0.01, < 0.01 (< 0.01)

a after 30 days allowed a 14 days recovery period on untreated diet

Max. maximum residue found in the dose group

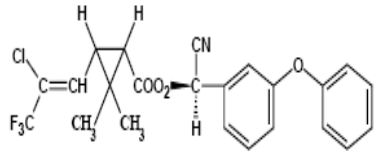
AV average of the dose group

APPRAISAL

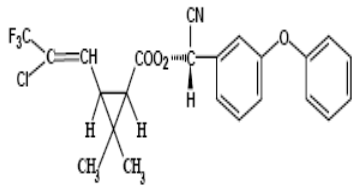
Lambda-cyhalothrin was scheduled as a priority compound under the periodic re-evaluation programme at the 34th Session of the CCPR as a replacement for cyhalothrin. The toxicological evaluation for lambda-cyhalothrin was conducted at JMPR 2007. The isomeric mixture cyhalothrin was evaluated several times by JMPR for residues (1984, 1986 and 1988) and once for toxicology (1984). The Meeting received information on lambda-cyhalothrin metabolism and environmental fate, methods of residue analysis, freezer storage stability, national registered use patterns, supervised residue trials, farm animal feeding studies and fate of residues in processing.

Although cyhalothrin and lambda-cyhalothrin are isomers, only lambda-cyhalothrin is supported by the manufacturer and therefore intended as a replacement for cyhalothrin. For cyhalothrin as a mixture of all isomers only limited information on the metabolism and the

environmental fate were submitted. No information on registered uses and/or supervised residue trial data was available to the Meeting.



lambda-cyhalothrin (R) (Z)-(1S)-cis-isomer



lambda-cyhalothrin (S)-(Z)-(1R)-cis-isomer

The following abbreviations are used for the metabolites discussed below:

cyhalothrin	3-(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethyl-cyano(3-phenoxyphenyl)methyl cyclopropanecarboxylate
lambda-cyhalothrin	1:1 mixture of (S)-α-cyano-3-phenoxybenzyl-(Z)-(1R,3R)-3-(2-chloro-3,3,3-trifluoroprop-1-enyl) -2,2-dimethylcyclopropane carboxylate and (R)-α-cyano-3-phenoxybenzyl (Z)-(1S,3S)-3-(2-chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropane carboxylate
Compound Ia	(Z)-3-(2-chloro-3,3,3-trifluoro-propenyl)-2,2-dimethylcyclo-propane carboxylic acid
Compound Ib	(1RS)-trans-3-(2-chloro-3,3,3-trifluoropropenyl)-2,2-dimethyl-cyclopropane carboxylic acid
Compound III	(RS)-α -cyano-3-phenoxy-benzyl alcohol
Compound IV	3-phenoxybenzaldehyde
Compound V	3-phenoxybenzoic acid
Compound IX	(RS)-3-phenoxymandelamide
Compound XI	3-(2-chloro-3,3,3-trifluoro-prop-1-enyl)-2-hydroxy-methyl-2-methyl-cyclo-propane carboxylic acid
Compound XV	(RS)-α -cyano-3-(4-hydroxy-phenoxy)benzyl (Z)-(1RS)-cis-3-(2-chloro-3,3,3-trifluoro-propenyl)-2,2-dimethyl-cyclopropane carboxylate
Compound XXIII	3-(4'-hydroxy)-phenoxy-benzoic acid
R157836	enantiomeric pair A, cis 1RαR and cis 1SαS enantiomers of cyhalothrin

Animal metabolism

The Meeting received animal metabolism studies with cyhalothrin in rats and lambda-cyhalothrin in laying hens and lactating goats. In these studies lambda-cyhalothrin was [^{14}C]labelled at the acid moiety in most cases. Additional information on the metabolism of cypermethrin in cows and laying hens was submitted which shares the structure of the alcohol moiety with lambda-cyhalothrin and has only a slightly lower log K_{ow} of 5.3–5.6 compared to the log K_{ow} of 7.0 for lambda-cyhalothrin. Corresponding to lambda-cyhalothrin the cleavage of the ester bond is the first metabolism step resulting in a comparable alcohol-moiety metabolite which follows a similar pathway subsequently.

In general lambda-cyhalothrin is cleaved at the ester bond as the first step of metabolism followed by hydroxylation at various sites of both breakdown products. These products are further conjugated with sulfate or glucose and excreted via the urine. Parent lambda-cyhalothrin is fat-soluble (log K_{ow} = 7.0) since residue concentrations in fat are approximately 5 to 10 times higher than in the

muscle. While unchanged parent compound contributed most to fatty tissues radioactivity, the residues found in liver and kidney at comparable TRR-levels consisted of cleaved and conjugated metabolites of higher polarity.

In rats oral doses of cyhalothrin were readily but incompletely absorbed (30–40% of radiolabel was recovered in urine). Most (70%) of the administered material was excreted in the faeces and urine within 24 h. After 7 days, 2–3% of the cyhalothrin administered persisted as unchanged residue in fat. Metabolism in rats involved initial cleavage of the molecule at the ester bond. In rats dosed with cyhalothrin, major metabolites identified in urine were the sulfate conjugate of compound XXIII and glucuronide conjugate of compound Ia. Minor metabolites identified were the unconjugated compound XXIII and compound V. (See the toxicology report for more details of laboratory animal metabolism)

For lactating goats dosed orally with [cyclopropyl-^{14}C]lambda-cyhalothrin at a rate equivalent to 10.8 mg/kg in the total diet for seven consecutive days, about 71% of the TRR was excreted (faeces 29.3%, urine 41.7%). Residues in milk reached a maximum after five days at a level of 0.27 mg/kg, mostly consisting of lambda-cyhalothrin (> 95%). Muscle gave relatively low total radioactive residues of 0.024–0.028 mg/kg compared to fat ranging from 0.13 to 0.44 mg/kg (0.32 mg/kg in average). Most of the radioactivity (> 88%) was identified as unchanged parent compound. In liver and kidney residues at a level of 0.34 and 0.2 mg/kg respectively were found. Lambda-cyhalothrin contributed to less than 7% of the TRR. Most of the residue was identified as the labelled cleavage metabolite Ia and its hydroxylated form (compound XI).

To investigate the fate of the alcohol-moiety, cows (non-lactating) were dosed orally with [benzyl-^{14}C-cypermethrin at a rate equivalent to 10 mg/kg of total diet for seven consecutive days. In liver and kidney the investigated radioactivity showed that analogous to lambda-cyhalothrin in goats the cleavage of the molecule is the initial breakdown reaction. The labelled alcohol-moiety fragment (compound V) was the dominant residue at levels of about 60% of the TRR, followed by its hydroxylation product compound XXIII at levels of 3.6 to 16% of the TRR (kidney and liver respectively). Due to the low total radioactivity in muscle no further identification was conducted while in fat more than 80% of the TRR consisted of unchanged [benzyl-^{14}C]cypermethrin.

In laying hens dosed orally with [cyclopropyl-^{14}C]lambda-cyhalothrin at a rate equivalent to 10.8 mg/kg of total diet for 14 consecutive days more than 98% of the administered dose was recovered from the excreta. In muscle tissues no TRR above 0.01 mg/kg was found and no further characterisation was possible. In the fat radioactive residues were between 0.17 to 0.46 mg/kg with unchanged lambda-cyhalothrin contributing more than 80% of the radioactivity. In the liver extensive metabolism occurred resulting mainly in the cleavage product compound Ia (51% of the TRR) and its hydroxylated product compound XI (9.5% of the TRR). No parent lambda-cyhalothrin was found in the liver of laying hens. In egg yolk about 60% of the TRR consisted of unchanged parent compound. Further radioactivity was characterized in the polar and hexane fraction amounting less than 10% of TRR. Unextractable residues were at 12.6% of the TRR.

For laying hens dosed orally with [phenoxy-^{14}C]labelled cypermethrin at a rate equivalent to approximately 10 mg/kg in the total diet (1.52 mg per bird and day) for 14 consecutive days similar results to the study with lambda-cyhalothrin were obtained. The labelled alcohol-moiety cleavage product compound V and its hydroxylated products compound XXIII were the main metabolites identified in liver. A subsequent transfer of these metabolites into other animal tissues or the eggs was observed in small amounts only (compound V in egg yolk at 1.2% of the TRR).

Plant metabolism

The Meeting received plant metabolism studies with [^{14}C]cyhalothrin and [^{14}C]lambda-cyhalothrin in apples, cabbage, wheat, cotton and soya beans. Parent substance labelled either as [cyclopropyl-^{14}C]- (cotton, wheat, soya beans), [phenyl-^{14}C]- (wheat) or [benzyl-^{14}C]lambda-cyhalothrin (cotton, soya beans) as well as [cyclopropyl-^{14}C]cyhalothrin (apples, cabbage) were used in the metabolism studies.

In general, the metabolism of cyhalothrin is limited to a few transformation steps. The cleavage of the ester bond is normally the first step followed by hydroxylation of the breakdown products. Translocation of the radioactivity within the plants investigated was not observed.

In the study on wheat both labelled test substances were applied at rates of 0.22 kg ai/ha. The wheat was treated in three variations: two treatments with a PHI of 14 days, two treatments with a PHI of 85 days or three treatments with a PHI of 30 days. Depending on the treatment, TRR values in grain differed significantly.

For two treatments with a PHI of 14 days only minor total residues were detected in wheat grain ranging from 0.002–0.007 mg/kg. Wheat grain with a PHI of 85 days (treated twice) also gave relatively low TRR values, i.e., from 0.005 to 0.018 mg/kg. An investigation of the radioactivity gave detectable residues of unchanged lambda-cyhalothrin, but these residues were below the LOQ of 0.001 mg/kg. The majority of the radioactivity was present in the water soluble phase but could not be further identified. For three applications and a PHI of 30 days the highest residues of the study were detected in the grain, which ranged from 0.112 to 0.131 mg/kg. More than 75% of the TRR was identified as lambda-cyhalothrin. Depending on the label the first products of the cleavage of the ester bond (compound Ia and V) were the only metabolites identified at levels below the LOQ.

For wheat foliage only the samples obtained from short PHIs (14 and 30 days) were analysed. After two treatments and a PHI of 14 days TRR values for both labels of 0.45 to 1.8 mg/kg were found. Three treatments and a PHI of 30 days led to higher radioactive residues ranging from 7.95 up to 10 mg/kg. In all samples, unchanged parent lambda-cyhalothrin was the main residue at levels > 80% of the TRR. Again the initial products of the ester bond cleavage and their hydroxylated metabolites were the only metabolites found at levels < 2% of the TRR each.

In soya beans both labels were applied as two treatments at rates of 0.02 kg ai/ha each. Samples of leaves and soya beans were taken 39 and 51 days after the last treatment respectively. In soya beans very low total radioactive residues ranging from 0.003 to 0.01 mg/kg were found. No further characterisation or identification of the radioactivity was achieved. In soya bean plants residues were higher (TRR 1.2–1.9 mg/kg). About half of the radioactivity was identified as lambda-cyhalothrin (43–52% of the TRR). For the [cyclopropyl-^{14}C]-label compound Ia was the major metabolite with 25% of the TRR. Further breakdown products were the hydroxylated cleavage products at levels below 7% of the TRR.

Two cotton studies were conducted to investigate the residues of lambda-cyhalothrin in leaves and seeds. After three applications of 0.066 kg ai/ha, cotton leaves were sampled at a PHI of 80 days and analysed. Total radioactive residues were quite comparable for both labels ranging from 2.9 to 4.1 mg/kg. Depending on the label, 37–52% of the TRR was identified as unchanged lambda-cyhalothrin. Further metabolites were identified as the initial cleavage products and their hydroxylated metabolites. Except compound Ia (17.6% of the TRR) all metabolites were at levels below 10% of the total radioactivity in the cotton leaves.

In the second experiment cotton was either sprayed three times at rates of 0.066 kg ai/ha each with a PHI of 101 days or the cotton seeds were directly treated using a syringe with a PHI of 14 days. After the direct treatment the analysis of the radioactivity showed that all of the lambda-cyhalothrin applied remained unchanged. No degradation on the parent substance was observed. Following foliar application, residues in the seeds were relatively low ranging from 0.01 to 0.027 mg/kg. No further identification of the radioactivity was performed.

Metabolism on cabbage was investigated using cyhalothrin. The cabbage plants were directly spotted with a [^{14}C]cyhalothrin solution. Treated leaves were removed from these plants at intervals of 2, 4, 5, 6 and 7 weeks. Two additional plants were sprayed either four or eight times at rates of 0.055 kg ai/ha with a PHI of 7 days.

The cabbage leaves spotted with [^{14}C]cyhalothrin showed a steady decrease of the parent compound. At 2 weeks after the treatment more than 80% of the TRR was identified as cyhalothrin. This percentage dropped to 54% after 5–6 weeks. The leaves harvested after 6 weeks were further

analysed and indicated both isomers of the initial cleavage products compound Ia and Ib as metabolites identified at levels of 4% of the TRR each.

After eight spray applications and a PHI of 7 days cabbage leaves showed total radioactive residues of 0.44 mg/kg. Most of the residues were located on the outer leaves (1.13 mg/kg) while only minor residues could be found within the cabbage head (0.003 mg/kg). In total about 80% of the TRR consisted of unchanged cyhalothrin. Again both isomers of the initial cleavage products (compound Ia and Ib) were identified as metabolites (3.0% and 0.8% of the TRR respectively).

In apples the metabolism was also investigated using the isomeric mixture of cyhalothrin labelled at the cyclopropyl-moiety. Ten apples were directly treated with the active ingredients and exposed to sunlight. At intervals of 0, 7, 14, 28 and 56 days two apples were harvested and analysed for radioactive residues. The results obtained from 0 to 28 days indicated that only very little degradation of cyhalothrin occurred. More than 97% of the TRR was identified as unchanged parent. After 56 days approximately 89% of the remaining TRR was cyhalothrin. Minor amounts of the isomers compound Ia and Ib were detected (< 3% of the TRR). The rest of the radioactivity was characterized as water soluble or unextractable.

Environmental fate in soil

The Meeting received information on aerobic soil metabolism and soil photolysis of lambda-cyhalothrin as well as studies on the behaviour in crop rotations. Due to the fact that mostly acid-labelled lambda-cyhalothrin was used in the aerobic soil metabolism study, additional information on the aerobic soil metabolism of alcohol-labelled cypermethrin was submitted.

The photolysis study conducted with [cyclopropyl-^{14}C]- and [phenyl-^{14}C]lambda-cyhalothrin at a rate of 40 g ai/ha showed no accelerated decrease in the residues under irradiation. The levels of parent compound in the samples were at comparable levels to the dark control samples.

In the aerobic soil metabolism studies conducted with [cyclopropyl-^{14}C]lambda-cyhalothrin at rates of 100–500 g ai/ha, DT_{50} values ranging from 22 to 83 days were reported. After 26 weeks a significant mineralisation was observed (up to 70% evolved $^{14}CO_2$). The main metabolites found after 90 to 181 days were the hydroxylated parent compound (compound XV) and the labelled cleavage products compound Ia, each accounted for less than 12% of the initial dose.

In comparable studies using [benzyl-^{14}C]-cypermethrin compounds III, IV and IX were the predominant metabolites. After the cleavage of the initial molecule into the labelled compound III subsequent oxidation into compound IV and conjugation appear to be the typical reaction pathways in soil.

Rotational crop studies using [cyclopropyl-^{14}C] and [phenyl-^{14}C]lambda-cyhalothrin were conducted on wheat, lettuce and carrots with plant back intervals of 30, 60 and 120 days. After treatment with approximately 0.47 kg ai/ha, samples from each commodity were taken and analysed for the total radioactivity for the phenyl-label and additionally for the nature of residue for the cyclopropyl-label.

The samples grown in soil treated with the phenyl-label gave very low residues overall, ranging from 0.002 mg/kg for carrot roots up to the highest concentration of 0.035 mg/kg in wheat straw. Due to the low level of radioactivity no further investigation of the radioactivity was performed.

For the cyclopropyl-label residues were higher ranging from 0.003 mg/kg in carrot roots up to 0.85 mg/kg in wheat straw. The characterisation of the radioactivity showed negligible residues of parent lambda-cyhalothrin in all matrices (< 0.5% of the TRR). Most of the radioactivity was identified as the first cleavage product compound Ia at 40–60% of the TRR. The remaining radioactivity was included in unidentified polar fractions or not extractable.

Methods of analysis

The Meeting received information on analytical methods for the determination of residues of the active substance cyhalothrin, lambda-cyhalothrin (enantiomeric pair B, cis 1RαS and cis 1SαR enantiomers of cyhalothrin), R157836 (enantiomeric pair A, cis 1RαR and cis 1SαS enantiomers of cyhalothrin) and for some metabolites in target crops and animal products (milk, meat, kidney, liver, fat and eggs).

In the methods the macerated samples are typically extracted with acetone:hexane (50:50 v/v) and the extract is cleaned by a solid phase clean-up either with a silica or Florisil column. The final residue is determined by GLC with ECD or MS detection. LOQs are at 0.01 mg/kg for all plant and animal matrices.

Analytical recovery data were satisfactory for cyhalothrin, lambda-cyhalothrin, its epimer R157836 and several metabolites for numerous commodities. Residue methods were tested by independent laboratories unfamiliar with the analysis and were found to have satisfactory recoveries and no background interferences.

Stability of residues in stored analytical samples

Information was received on the freezer storage stability of lambda-cyhalothrin residues in plant and animal commodities. For some commodities the stability for the epimer of lambda-cyhalothrin (R157836) was also investigated.

Lambda-cyhalothrin residues were stable in the commodities apple and cabbage for 16 months and were stable for 26 months in apple, peach, cabbage, pea, potato, rape seeds, wheat grain, sugar beet roots and cotton seed. R157836 was stable in apples and cabbages for at least 16 months.

In animal commodities lambda-cyhalothrin residues were stable for 3 months (bovine muscle, kidney, liver, fat and milk) and 26 months (poultry muscle, liver fat and eggs).

Residue definition

The residue following use of lambda-cyhalothrin on crops is predominantly lambda-cyhalothrin. Epimerisation of lambda-cyhalothrin was measurable, but only at very low levels. Methods are available that can measure cyhalothrin as well as the individual diastereoisomers and epimers.

The ratio of lambda-cyhalothrin to major metabolites differed in the ruminant metabolism and feeding studies. In the feeding study, lambda-cyhalothrin is the major component of the residue in kidney and liver while in metabolism studies conducted with labelled material only minor amounts of the parent substance were detected. In muscle, fat, milk and eggs, lambda-cyhalothrin was the dominant residue.

Based on the actual residue measured (lambda-cyhalothrin), the Meeting recommended that the residue definition for plant and animal commodities for compliance with MRLs and for estimation of dietary intake should be lambda-cyhalothrin. The log K_{ow} of lambda-cyhalothrin of 7.0 and the animal metabolism and feeding studies suggest that lambda-cyhalothrin should be described as fat-soluble. In the ruminant and poultry metabolism studies lambda-cyhalothrin residues were approximately 5–10 times greater in fat than muscle.

For cyhalothrin, sum of isomers MRLs for animal commodities were established by JECFA in 2004. In addition the evaluation for lambda-cyhalothrin in by JMPR 2007 identified all isomers of cyhalothrin to be of toxicological concern in relation to dietary intake. In harmony with the JECFA MRLs established and the toxicological properties of cyhalothrin, a residue definition based on all isomers is recommended.

Definition of the residue (for compliance with MRL and for estimation of dietary intake) for plant and animal commodities: *cyhalothrin, sum of isomers.*

The residue is fat-soluble.

Results of supervised residue trials on crops

The Meeting received supervised residue trials data for lambda-cyhalothrin on citrus fruits (mandarins and oranges), pome fruits (apples and pears), stone fruits (cherries, peaches and plums), grapes, small berries (currants, gooseberries, raspberries and strawberries), olives, mangoes, onions, brassica vegetables (broccoli, cauliflower and cabbage), spinach, fruiting vegetables cucurbits (cucumbers, courgettes and melons), fruiting vegetables other than cucurbits (bell peppers, tomatoes and sweet corn), legume vegetables (beans, peas and immature soya beans), pulses (beans, peas, soya beans), root and tuber vegetables (carrots and potatoes), stem vegetables (asparagus and leek), cereals (wheat, oats, barley, maize, rice, rye, triticale and sorghum), sugarcane, tree nuts (almonds and pecan) and oilseeds (oilseed rape, sunflowers, cotton and peanuts).

In trials where duplicate field samples from replicated or unreplicated plots were taken at each sampling time and analysed separately, the sample with the higher residue was taken as the best estimate of the residue from the plot. All residue data refers to lambda-cyhalothrin residues as measured.

Labels (or translation of labels) were available from Australia, France, Italy, Portugal, Spain, Thailand and the United States describing the registered uses of lambda-cyhalothrin.

Citrus fruits

Lambda-cyhalothrin is registered in Portugal and Spain for use on citrus fruits at 0.001 and 0.002 kg ai/hL respectively with a PHI of 7 days. Supervised residue trials conducted in Southern Europe on mandarins and oranges according to the Spanish GAP were submitted. For whole mandarin fruits residues were (n = 10): 0.02, 0.03, 0.04, 0.05, 0.05, 0.06, 0.06, 0.07, 0.11 and 0.16 mg/kg. The corresponding residues in mandarin pulp were < 0.01(10) mg/kg. For whole orange fruits residues were (n = 5): 0.04(4) and 0.05 mg/kg and in the orange pulp < 0.01(6) and 0.01 mg/kg.

The Meeting decided to combine the trials in the mandarins and oranges for the purposes of estimating a maximum residue level, an HR and a STMR. Residues for whole citrus fruit in rank order were: (n = 15): 0.02, 0.03, 0.04(5), 0.05(3), 0.06, 0.06, 0.07, 0.11 and 0.16 mg/kg. Residues in citrus pulp in rank order were: < 0.01(16) and 0.01 mg/kg.

The Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in citrus fruit of 0.2 (whole fruit), 0.01(pulp) and 0.01 mg/kg (pulp) respectively.

Pome fruit

Lambda-cyhalothrin is registered in France for use on apple, pear, nashi pear and quinces and in Spain for the use on fruit trees at 0.002 kg ai/hL with a PHI of 7 days. Supervised residue trials conducted in Southern Europe on apples according to the French GAP were submitted. The apple fruit residues were (n = 8): < 0.01, 0.01, 0.02, 0.02, 0.03, 0.03, 0.04 and 0.04 mg/kg.

In the USA lambda-cyhalothrin is registered on apples, pears and quinces at 0.045 kg ai/ha with a PHI of 21 days. Supervised residue trials conducted in the US on apples and pears according to the US GAP were submitted. In apples fruits a residue level of 0.09 mg/kg was found. The pear fruit residues were (n = 7): 0.05, 0.05, 0.06, 0.07, 0.09, 0.1 and 0.1mg/kg.

The Meeting decided to combine the trials for apples and pears conducted according to the comparable US GAP for the purpose of estimation a maximum residue level, an HR and an STMR for pome fruits. Residues for fruits in rank order were (n = 8) 0.05, 0.05, 0.06, 0.07, 0.09, 0.09, 0.1 and 0.1 mg/kg.

The Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in pome fruits of 0.2, 0.08 and 0.1 mg/kg respectively.

Stone fruit

Lambda-cyhalothrin is registered in the US for use on cherries at 0.045 kg ai/ha with a PHI of 14 days. Supervised residue trials conducted in the US according to the US GAP were submitted. In

cherry fruits residues were (n = 10): 0.05, 0.07, 0.07, 0.09, 0.11, 0.14, 0.15, 0.16, 0.18 and 0.18 mg/kg.

The Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in cherries of 0.3, 0.125 and 0.18 mg/kg respectively.

In France lambda-cyhalothrin is registered on peaches, apricots and nectarines at 0.002 kg ai/hL with a PHI of 7 days. Supervised residue trials conducted in France according to the French GAP were submitted. In peaches residues were (n = 3): 0.02, 0.02 and 0.03 mg/kg.

In Italy the registration on peaches, apricots and nectarines is for 0.004 kg ai/hL with a PHI of 7 days. Supervised residue trials conducted in Southern Europe according to the Italian GAP were submitted. In peaches residues were (n = 6): 0.01, 0.02, 0.03(3) and 0.05 mg/kg.

Lambda-cyhalothrin is registered in the US for use on peaches, apricots and nectarines at 0.045 kg ai/ha with a PHI of 14 days. Supervised residue trials conducted in the US according to the US GAP were submitted. In peach fruits residues were (n = 14): 0.02, 0.04, 0.05, 0.06, 0.08, 0.09, 0.09, 0.11, 0.11, 0.13, 0.14, 0.14, 0.2 and 0.33 mg/kg.

The Meeting decided to extrapolate the residue data for peaches to apricots and nectarines. Based on the GAP from the US the Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in peaches, apricots and nectarines of 0.5, 0.1 and 0.33 mg/kg respectively.

In France lambda-cyhalothrin is registered on plums at 0.002 kg ai/hL with a PHI of 7 days. Supervised residue trials conducted in France according to the French GAP were submitted. In plums residues were (n = 2): < 0.01 and 0.01 mg/kg.

Lambda-cyhalothrin is registered in the US for use on plums at 0.045 kg ai/ha with a PHI of 14 days. Supervised residue trials conducted in the US according to the US GAP were submitted. In plums residues were (n = 12): < 0.01, < 0.01, 0.01, 0.01, 0.02(3), 0.03, 0.04, 0.06, 0.07, 0.1 mg/kg.

Based on the GAP from the US the Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in plums, except prunes of 0.2, 0.02 and 0.1 mg/kg respectively.

Berries and other small fruits

Lambda-cyhalothrin is registered in France for use on currants at 0.002 kg ai/hL with a PHI of 21 days. Supervised residue trials conducted in Northern Europe according to the French GAP were submitted. In currants residues were (n = 4): 0.02, 0.02, 0.06 and 0.07 mg/kg.

In Spain lambda-cyhalothrin is registered on currants at 0.02 kg ai/ha with a PHI of 14 days. Supervised residue trials conducted in Southern Europe according to the Spanish GAP were submitted. In currants residues were (n = 9): < 0.01, < 0.01, 0.02, 0.03(3), 0.04, 0.06 and 0.07 mg/kg.

For gooseberries supervised residue trial data was submitted, but the only available GAP from Italy for small berries and other fruits is registered at a 50% higher application rate.

In Portugal lambda-cyhalothrin is registered on grapes at 0.002 kg ai/hL with a PHI of 7 days. Supervised residue trials conducted in Southern Europe according to the Portuguese GAP were submitted. In grapes residues were (n = 11): < 0.01(4), 0.02(4), 0.03, 0.04 and 0.06 mg/kg.

In Italy and Spain lambda-cyhalothrin is registered on grapes at 0.003 kg ai/hL with a PHI of 7 days. One supervised residue trial conducted in Southern France according to these GAPs was submitted. In grapes residues were: 0.01 mg/kg.

Lambda-cyhalothrin is registered in France for use on raspberries at 0.002 kg ai/hL with a PHI of 14 days. Supervised residue trials conducted in France and the UK according to the French GAP were submitted. In raspberries residues were (n = 4): < 0.01, 0.01, 0.02 and 0.04 mg/kg.

In France lambda-cyhalothrin is registered on strawberries at 0.013 kg ai/ha with a PHI of 3 days. Supervised residues trials conducted in France (North and South), Italy and the UK according to

the French GAP were submitted. In strawberries residues were (n = 14): < 0.01(6), 0.01, 0.02(3), 0.03, 0.03, 0.04 and 0.06 mg/kg.

In Spain lambda-cyhalothrin is registered on strawberries at 0.02 kg ai/ha with a PHI of 3 days. Supervised residues trials conducted in Southern Europe according to the Spanish GAP were submitted. In strawberries residues were (n = 16): 0.01(3), 0.02(6), 0.03(3), 0.05, 0.07, 0.08 and 0.09 mg/kg.

The Meeting noted that residues in berries and other small fruits are of the same magnitude and decided to extrapolate the data population based on the use of lambda-cyhalothrin in strawberries according to Spanish GAP to a group maximum residue recommendation. The estimated maximum residue level, STMR value and HR value for lambda-cyhalothrin in berries and other small fruits were 0.2, 0.02 and 0.09 mg/kg respectively.

Olives

Lambda-cyhalothrin is registered in France for use on olive trees at 0.002 kg ai/hL with a PHI of 7 days. Supervised residue trials conducted in Southern Europe according to the French GAP were submitted. In olives residues were (n = 12): 0.03, 0.05, 0.06, 0.06, 0.09, 0.12, 0.13, 0.18, 0.25, 0.25, 0.41 and 0.42 mg/kg.

The Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in olives of 1, 0.125 and 0.42 mg/kg respectively.

Mangoes

Lambda-cyhalothrin is registered in Thailand for use on mango trees at 1.25 g ai/hL with a PHI of 8 days. Supervised residue trials conducted in Thailand according to this GAP were submitted. In mango fruits residues were (n = 5): 0.01, 0.02, 0.03, 0.04 and 0.07 mg/kg.

The Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in mango of 0.2, 0.03 and 0.07 mg/kg respectively.

Bulb vegetables

Lambda-cyhalothrin is registered in France for use on leek at 0.008 kg ai/ha with a PHI of 7 days. Supervised residue trials conducted in Northern France and the United Kingdom according to this GAP were submitted. In leek plants residues were (n = 8): 0.02, 0.03, 0.04, 0.05, 0.05, 0.1, 0.1 and 0.11 mg/kg.

Lambda-cyhalothrin is registered in the United States for use on bulb onions at 0.034 kg ai/ha with a PHI of 14 days. Supervised residue trials conducted in the US according to this GAP were submitted. In dry onions residues were (n = 9): < 0.01(4), 0.01, 0.04, 0.05, 0.06 and 0.06 mg/kg.

The Meeting decided to extrapolate the data for leek to support a group maximum residue level for the group of bulb vegetables. The Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in bulb vegetables of 0.2, 0.05 and 0.11 mg/kg, respectively.

Flowerhead brassica

Lambda-cyhalothrin is registered in the United States for use on broccoli at 0.034 kg ai/ha with a PHI of 1 day. Supervised residue trials conducted in the US according to this GAP were submitted. In broccoli residues were (n = 10): 0.04, 0.05, 0.09, 0.18, 0.2, 0.23, 0.27, 0.28, 0.3 and 0.3 mg/kg.

In Spain lambda-cyhalothrin is registered on broccoli at 0.02 kg ai/ha with a PHI of 3 days. Supervised residues trials conducted in Spain according to the GAP were submitted. In broccoli residues were (n = 4): 0.06, 0.08, 0.08 and 0.09 mg/kg.

Lambda-cyhalothrin is registered in Spain for use on cauliflower at 0.02 kg ai/ha with a PHI of 7 days. One supervised residue trial conducted in Spain according to the GAP was submitted. In cauliflower residues were (n = 1): 0.02 mg/kg.

The Meeting noted that the data for flowerhead brassica from Spain is not sufficient for a proposal. Based on the US GAP for broccoli the Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in flowerhead brassicas of 0.5, 0.215 and 0.3 mg/kg, respectively.

Head cabbages

Lambda-cyhalothrin is registered in the United States for use on head cabbage at 0.034 kg ai/ha with a PHI of 1 day. Supervised residue trials conducted in the US according to this GAP were submitted. In cabbage residues were (n = 6): 0.36, 0.41, 0.46, 0.52, 0.55 and 0.67 mg/kg.

In Spain lambda-cyhalothrin is registered on cabbage at 0.02 kg ai/ha with a PHI of 3 days. Supervised residues trials conducted in Southern Europe according to the GAP were submitted. In cabbage residues were (n = 6): 0.01, 0.02, 0.08, 0.08, 0.13 and 0.17 mg/kg.

Based on the more critical US GAP the Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in head cabbages of 1, 0.49 and 0.67 mg/kg, respectively. The IESTI calculation indicates that the consumption of head cabbage at the HR level of 0.67 mg/kg coming from trials according this GAP would lead to an exceedance of the ARfD by 160%. Consequently, the Meeting used the prospective alternative GAP approach and selected residue data according to the Spanish GAP for the maximum residue level estimation.

Based on the Spanish GAP the Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in head cabbages of 0.3, 0.08 and 0.17 mg/kg, respectively.

Spinach

Lambda-cyhalothrin is registered in France for use on spinach at 0.006 kg ai/ha with a PHI of 7 days. Supervised residue trials conducted in France according to this GAP were submitted. In spinach residues were (n = 2): 0.04 and 0.08 mg/kg.

The Meeting decided that the residue data submitted for spinach is not sufficient to recommend a maximum residue level, an STMR and an HR value for spinach.

Fruiting vegetables – Cucurbits

Lambda-cyhalothrin is registered in Spain for use on cucurbits (outdoor and protected) at 0.02 kg ai/ha with a PHI of 3 days. Supervised residue trials conducted in Spain and Italy according to this GAP were submitted.

In cucumbers grown indoors residues were (n = 4): < 0.01(4) mg/kg.

For courgettes grown in field residues were (n = 7): < 0.01, < 0.01, 0.01(5) mg/kg.

In France lambda-cyhalothrin is registered on melons (outdoor and protected) at 0.02 kg ai/ha with a PHI of 3 days. Supervised residues trials conducted in Northern France according to the GAP were submitted for the indoor and outdoor application.

In whole melon fruits grown in field residues were (n = 6): < 0.01(6) mg/kg. The corresponding residue values in melon pulp (outdoor melons) were (n = 6): < 0.01(6) mg/kg.

In whole melon fruits grown under protection residues were (n = 5): < 0.01(4) and 0.02 mg/kg. The corresponding residue values in melon pulp (protected melons) were (n = 5): < 0.01(5) mg/kg.

The Meeting decided to combine the trials for cucumbers, courgettes and melons for mutual support for the purpose of estimating a maximum residue level, an HR and a STMR. Residues for fruiting vegetables, cucurbits in rank order were (n = 22) < 0.01(16), 0.01(5) and 0.02 mg/kg.

The Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in fruiting vegetables, cucurbits of 0.05, 0.01 and 0.02 mg/kg, respectively.

Fruiting vegetables other than cucurbits, except mushrooms

Lambda-cyhalothrin is registered in the United States for use on sweet peppers at 0.034 kg ai/ha with a PHI of 5 days. Supervised residue trials on bell pepper conducted in the US according to this GAP were submitted. In bell pepper residues were (n = 8): 0.01, 0.02(3), 0.05, 0.05, 0.12 and 0.15 mg/kg.

For the purpose to extrapolate to dry Chilli pepper the Meeting estimated an STMR value and an HR value for lambda-cyhalothrin in sweet peppers of 0.035 and 0.15 mg/kg, respectively.

For tomatoes lambda-cyhalothrin is registered in the United States at 0.034 kg ai/ha with a PHI of 5 days. Supervised residue trials conducted in the US according to this GAP were submitted. In tomatoes residues were (n = 23): < 0.01(4), 0.01, 0.01, 0.02(4), 0.03(3), 0.04(5), 0.06, 0.08, 0.09, 0.13 and 0.15 mg/kg.

Lambda-cyhalothrin is registered in the United States for use on sweet corn at 0.034 kg ai/ha with a PHI of 1 days. Supervised residue trials conducted in the US according to this GAP were submitted. In sweet corn (on the cob) residues were (n = 6): < 0.01(4), 0.14 and 0.18 mg/kg.

The Meeting decided to combine all data for mutual support to recommend a group MRL for fruiting vegetables other than cucurbits, except fungi. The corresponding reside data was (n = 37): < 0.01(8), 0.01(3), 0.02(7), 0.03(3), 0.04(5), 0.05, 0.05, 0.06, 0.08, 0.09, 0.12, 0.13, 0.14, 0.15, 0.15 and 0.18 mg/kg. Based on the combined data for lambda-cyhalothrin the Meeting estimated a maximum residue level, an STMR value and an HR value of 0.3, 0.03 and 0.18 mg/kg, respectively.

Applying the default concentration factor of 10 for sweet pepper to dried chilli pepper and an HR value of 0.15 mg/kg for sweet pepper the Meeting estimated a maximum residue level, an STMR and an HR value of 3, 0.35 and 1.5 mg/kg for lambda-cyhalothrin in dried chilli pepper, respectively.

Legume vegetables

Lambda-cyhalothrin is registered in the United States for use on green beans as legume vegetables at 0.034 kg ai/ha with a PHI of 7 days. Supervised residue trials conducted in the US according to this GAP were submitted. In beans with pods (fresh) residues were (n = 6): 0.02(4), 0.03 and 0.03 mg/kg.

For green beans lambda-cyhalothrin is registered in Spain at 0.02 kg ai/ha with a PHI of 7 days. Supervised residue trials conducted in Southern Europe according to this GAP were submitted. In beans with pods (fresh) residues were (n = 5): 0.01, 0.02, 0.02, 0.03 and 0.04 mg/kg.

Lambda-cyhalothrin is registered in the United States for use on peas as legume vegetables at 0.034 kg ai/ha with a PHI of 7 days. Supervised residue trials conducted in the US according to this GAP were submitted. In peas without pods (fresh) residues were (n = 3): 0.01, 0.05 and 0.11 mg/kg.

For fresh peas lambda-cyhalothrin is registered in Spain at 0.02 kg ai/ha with a PHI of 7 days. Supervised residue trials conducted in Southern Europe according to this GAP were submitted. In peas without pods (fresh) residues were (n = 5): < 0.01(5) mg/kg.

For immature soya beans lambda-cyhalothrin is registered in Thailand at 0.016 kg ai/ha with a PHI of 8 days. Supervised residue trials conducted in Thailand according to this GAP were submitted. In whole pods with immature soya bean seeds residues were (n = 4): 0.05, 0.06, 0.07 and 0.08 mg/kg.

The Meeting decided to combine the trials for beans with pods and peas without pods according to US GAP for the purpose of estimating a maximum residue level, an HR and an STMR for the group of legume vegetables. Residues in rank order were (n = 9): 0.01, 0.02(4), 0.03, 0.03, 0.05 and 0.11 mg/kg.

The Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in legume vegetables of 0.2, 0.02 and 0.11 mg/kg, respectively.

Pulses

Lambda-cyhalothrin is registered in the United States for use on beans and peas as pulses at 0.034 kg ai/ha with a PHI of 21 days. Supervised residue trials conducted on beans and peas in the US according to this GAP were submitted. In bean seeds (dry) residues were (n = 9): < 0.01(9) mg/kg. In pea seeds (dry) residues were (n = 5): < 0.01(4) and 0.05mg/kg.

For soya beans lambda-cyhalothrin is registered in the US at 0.034 kg ai/ha with a PHI of 30 days for ground and aerial application. Supervised residue trials conducted in the US according to this GAP were submitted. In soya bean seeds (dry) residues were (n = 19): < 0.01(19) mg/kg.

The Meeting decided to combine the trials for beans, peas and soya beans as pulses according to US GAP for the purpose of estimation a maximum residue level, an HR and a STMR. Residues for pulses in rank order are (n = 33): < 0.01(32) and 0.05 mg/kg.

The Meeting estimated a maximum residue level and an STMR value for lambda-cyhalothrin in pulses of 0.05 and 0.01 mg/kg, respectively.

Root and tuber vegetables

Lambda-cyhalothrin is registered in Italy for use on carrots at 0.013 kg ai/ha with a PHI of 3 days. Supervised residue trials conducted in Southern Europe with exaggerated rates of 0.025 kg ai/ha were submitted. In carrot roots residues were (n = 7): < 0.01(7) mg/kg.

Lambda-cyhalothrin is registered in Italy for use on potatoes at 0.013 kg ai/ha with a PHI of 15 days. Supervised residue trials conducted in Southern Europe with exaggerated rates of 0.025 kg ai/ha were submitted. In potato tubers residues were (n = 8): < 0.01(8) mg/kg.

The Meeting decided to combine the data available for the group of root and tuber vegetables based on the residue data for carrots and potatoes. The combined residues derived from supervised residue trials at exaggerated rates were (n = 15): < 0.01(15) mg/kg. The Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in root and tuber vegetables of 0.01*, 0 and 0 mg/kg, respectively.

Asparagus

Lambda-cyhalothrin is registered in Thailand for use on asparagus at 0.018 kg ai/ha with a PHI of 3 days. Supervised residue trials conducted in Thailand according to this GAP were submitted. In asparagus sticks residues were (n = 6): 0.01(6) mg/kg.

The Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in asparagus of 0.02, 0.01 and 0.01 mg/kg, respectively.

Barley grain

In France lambda-cyhalothrin is registered on barley at 0.008 kg ai/ha with a PHI of 28 days. Supervised residues trials on barley conducted in Southern Europe according this GAP were submitted. In barley grain residues were (n = 29): < 0.01(3), 0.01(8), 0.02(5), 0.03(4), 0.04(4), 0.05, 0.06, 0.07, 0.08 and 0.33 mg/kg.

The Meeting estimated a maximum residue level and an STMR value for lambda-cyhalothrin in barley grain of 0.5 and 0.02 mg/kg, respectively.

Maize grain

Lambda-cyhalothrin is registered in the United States for use on maize at 0.034 kg ai/ha with a PHI of 21 days. Supervised residue trials conducted in the US according to this GAP were submitted. In maize grain residues were (n = 19): < 0.01(18) and 0.01 mg/kg.

The Meeting estimated a maximum residue level and an STMR value for lambda-cyhalothrin in maize grain of 0.02 and 0.01 mg/kg, respectively.

Oats, rye, triticale and wheat grain

Lambda-cyhalothrin is registered in the France for use on oats at 0.008 kg ai/ha with a PHI of 28 days. Supervised residues trials on oats conducted in Germany according to this GAP were submitted. In oats grain residues were (n = 5): < 0.01(4) and 0.02 mg/kg.

In France lambda-cyhalothrin is registered on rye at 0.008 kg ai/ha with a PHI of 28 days. One supervised residues trials on rye conducted in Germany according to this GAP was submitted. In rye grain residues were (n = 1): 0.01 mg/kg.

In France lambda-cyhalothrin is registered on triticale at 0.008 kg ai/ha with a PHI of 28 days. One supervised residues trials on triticale conducted in Germany according to this GAP was submitted. In triticale grain residues were (n = 1): < 0.01 mg/kg.

Lambda-cyhalothrin is registered in the United States for use on wheat at 0.034 kg ai/ha with a PHI of 30 days. Supervised residue trials conducted in the US according to this GAP were submitted. In wheat grain residues were (n = 24): < 0.01(19), 0.01, 0.01, 0.02, 0.02 and 0.03 mg/kg.

In France lambda-cyhalothrin is registered on wheat at 0.008 kg ai/ha with a PHI of 28 days. Supervised residues trials on wheat conducted in Germany according to this GAP were submitted. In wheat grain residues were (n = 2): < 0.01 and 0.01 mg/kg.

The Meeting decided to extrapolate the data for wheat grain according to US GAP to make recommendation for oats, rye and triticale grain. The Meeting estimated a maximum residue level and an STMR value for lambda-cyhalothrin in oats, rye, triticale and wheat grain of 0.05 and 0.01 mg/kg, respectively.

Rice grain

In the US lambda-cyhalothrin is registered on rice at 0.045 kg ai/ha with a PHI of 21 days. Supervised residue trials conducted in the US according to this GAP were submitted. In rice grain residues were (n = 16): 0.06, 0.14, 0.15, 0.19, 0.2, 0.2, 0.24, 0.27, 0.32, 0.35, 0.42, 0.47, 0.48, 0.51, 0.66 and 0.79 mg/kg.

The Meeting estimated a maximum residue level and an STMR value for lambda-cyhalothrin in rice grain of 1 and 0.295 mg/kg respectively.

Sorghum grain

Lambda-cyhalothrin is registered in the United States for use on sorghum at a maximum of 0.034 kg ai/ha with a PHI of 30 days. Supervised residue trials from the US were conducted at lower application rates of 0.022 kg ai/ha using ground and aerial application as well as furrow irrigation. None of these residue trials matched the maximum GAP submitted for sorghum.

The Meeting decided that the data submitted was not sufficient for an evaluation for the use of lambda-cyhalothrin in sorghum grain.

Sugar cane

Lambda-cyhalothrin is registered in the United States for use on sugar cane at 0.045 kg ai/ha with a PHI of 21 days. Supervised residue trials conducted in the US according to this GAP were submitted. In sugar cane residues were (n = 9): < 0.01, < 0.01, 0.01, 0.02(5) and 0.03 mg/kg.

The Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in sugar cane of 0.05, 0.02 and 0.03 mg/kg, respectively.

Tree nuts

Lambda-cyhalothrin is registered in the United States for use on almonds at 0.045 kg ai/ha with a PHI of 14 days. Supervised residue trials conducted in the US according to this GAP were submitted. In almond nutmeat residues were (n = 5): < 0.01(5) mg/kg.

For pecans lambda-cyhalothrin is also registered in the US at 0.045 kg ai/ha with a PHI of 14 days. Supervised residue trials conducted in the US according to this GAP were submitted. In pecan nutmeat residues were (n = 8): < 0.01(8) mg/kg.

Due to the fact that lambda-cyhalothrin is non-systemic and is mainly located on the surface of the commodities the Meeting decided to combine the data for almond and pecan nutmeat for mutual support to extrapolate to the whole group of tree nuts. The combined residues are: < 0.01(13) mg/kg

The Meeting estimated a maximum residue level, an STMR value and an HR value for lambda-cyhalothrin in tree nuts of 0.01*, 0.01 and 0.01 mg/kg, respectively.

Oilseeds

Lambda-cyhalothrin is registered in the United States for use on oilseed rape at 0.034 kg ai/ha with a PHI of 7 days. Supervised residue trials conducted in the US according to this GAP were submitted. In rape seeds residues were (n = 7): < 0.01(3), 0.01, 0.02, 0.05 and 0.05 mg/kg.

Lambda-cyhalothrin is registered in the United States for use on sunflowers at 0.034 kg ai/ha with a PHI of 45 days either with ground or with aerial application. Supervised residue trials conducted in the US according to these GAPs were submitted. In sunflower seeds residues following ground application were (n = 11): < 0.01(6), 0.01, 0.01, 0.03, 0.04 and 0.15 mg/kg. After aerial application residues in the seeds were (n = 5): < 0.01(4) and 0.03 mg/kg.

The Meeting decided that the data for sunflower seeds from ground and aerial application were from the same data population and can be combined. The combined residues were (n = 16): < 0.01(10), 0.01, 0.01, 0.03, 0.03, 0.04 and 0.15 mg/kg.

Lambda-cyhalothrin is registered in the United States for use on cotton at 0.045 kg ai/ha with a PHI of 21 days either with ground or with aerial application. Supervised residue trials conducted in the US according to the GAP for aerial application were submitted. In cottonseeds residues following aerial application were (n = 4): < 0.01(4) mg/kg

Lambda-cyhalothrin is registered in the United States for use on peanuts at 0.034 kg ai/ha with a PHI of 14 days either with ground or with aerial application. Supervised residue trials conducted in the US according to the GAP for both application techniques were submitted. In peanut nutmeat residues following ground application were (n = 6): < 0.02(6) mg/kg. After aerial application residues in the nutmeat were (n = 2): < 0.02 and < 0.02 mg/kg.

The Meeting decided that the data for peanut nutmeat from ground and aerial application were from the same data population and can be combined. The combined residues are (n = 8): < 0.02(8) mg/kg.

Based on the use on sunflowers the Meeting decided to recommend a group maximum residue level for lambda-cyhalothrin in oilseeds. The estimated maximum residue level and STMR value for lambda-cyhalothrin in oilseeds were 0.2 and 0.01 mg/kg, respectively.

Peanut hay

Lambda-cyhalothrin is registered in the United States for use on peanuts at 0.034 kg ai/ha with a PHI of 14 days either with ground or with aerial application. Supervised residue trials conducted in the US according to the GAP for both application techniques were submitted, but only data after ground treatment is available for peanut hay. In peanut hay residues following ground application were (n = 5): 0.35, 0.65, 1.3, 1.3 and 2.2 mg/kg.

The Meeting estimated an STMR value and a highest residue value for lambda-cyhalothrin in peanut hay of 1.3 and 2.2 mg/kg respectively.

Soya bean fodder

For soya beans lambda-cyhalothrin is registered in the US at 0.034 kg ai/ha with a PHI of 30 days for ground and aerial application. One supervised residue trial conducted in the US according to the GAP for ground treatment was submitted. In soya bean fodder residues were: 0.3 mg/kg.

The Meeting concluded that the data submitted on soya bean fodder is not sufficient for an estimation of STMR and highest residue values.

Barley, oats, rye, sorghum and wheat forage

Due to the low degradation rate of lambda-cyhalothrin in plant metabolism studies no significant decline related to the dry matter content was anticipated by the Meeting. Therefore, the highest residue up to the PHI specified for grain harvesting was used for forage commodities unless specific limitations for grazing and/or forage were given on the label.

Lambda-cyhalothrin is registered in the United States for use on wheat at 0.034 kg ai/ha with a PHI for grazing and forage of 7 days. Supervised residue trials conducted in the US according to this GAP were submitted. In wheat forage residues were (n = 23): < 0.01, < 0.01, 0.19, 0.26, 0.27, 0.29, 0.3, 0.3, 0.31, 0.33, 0.35, 0.35, 0.37, 0.38, 0.43, 0.43, 0.51, 0.59, 0.65, 0.71, 0.75. 0.91 and 1.2 mg/kg.

In France lambda-cyhalothrin is registered on wheat at 0.008 kg ai/ha with a PHI of 28 days. Supervised residues trials on wheat conducted in Germany according to this GAP were submitted. In wheat forage residues were (n = 4): 0.04, 0.04, 0.05 and 0.06 mg/kg.

In Italy lambda-cyhalothrin is registered on barley at a rate of 0.015 kg ai/ha without a specified PHI for forage or grazing. Supervised residues trials conducted in Southern Europe according to this GAP were submitted. In barley forage residues after 0 to 18 days were (n = 12): 0.18, 0.24, 0.24, 0.28, 0.42, 0.42, 0.55, 0.72, 0.86, 0.92, 1.1 and 1.4 mg/kg.

In France lambda-cyhalothrin is registered on barley at 0.008 kg ai/ha without a specified PHI for forage or grazing. Supervised residues trials on barley conducted in Germany according to this GAP were submitted. In barley forage residues were (n = 5): 0.07, 0.15, 0.46, 0.52 and 0.88 mg/kg.

Lambda-cyhalothrin is registered in the France for use on oats at 0.008 kg ai/ha without a specified PHI for forage or grazing. Supervised residues trials on oats conducted in Germany according to this GAP were submitted. In oats forage after 0 days residues were (n = 5): 0.08, 0.17, 0.24, 0.24 and 0.3 mg/kg.

In France lambda-cyhalothrin is registered on rye at 0.008 kg ai/ha without a specified PHI for forage or grazing. One supervised residues trials on rye conducted in Germany according to this GAP was submitted. In rye forage after 0 days residues were (n = 1): 0.15 mg/kg.

In France lambda-cyhalothrin is registered on triticale at 0.008 kg ai/ha without a specified PHI for forage or grazing. One supervised residues trials on triticale conducted in Germany according to this GAP was submitted. In triticale forage after 0 days residues were (n = 1): 0.16 mg/kg.

Lambda-cyhalothrin is registered in the United States for use on sorghum at 0.034 kg ai/ha with a PHI of 30 days. Supervised residue trials conducted in the US according to this GAP were submitted. In sorghum forage residues after 30 days within 30% of the GAP were (n = 10): 0.06, 0.08, 0.09, 0.09, 0.1, 0.11, 0.14, 0.16, 0.18 and 0.22 mg/kg.

The Meeting decided to estimate STMR and highest residue values for barley, oats, rye, sorghum and wheat forage on basis of the highest data population for barley according to the GAP from Italy. The corresponding STMR and highest residue values for lambda-cyhalothrin in barley, oats, rye, sorghum and wheat forage were 0.49 and 1.4 mg/kg (fresh-weight basis), respectively.

Maize forage

Lambda-cyhalothrin is registered in the United States for use on maize and sweet corn at 0.034 kg ai/ha with a PHI of 1 day for grazing. Supervised residue trials conducted in the US

according to this GAP were submitted. In maize forage residues were (n = 6): 1.2, 1.4, 1.7, 2.0, 2.3 and 2.8 mg/kg.

The Meeting estimated an STMR value and a highest residue value for lambda-cyhalothrin in maize forage of 1.85 and 2.8 mg/kg (fresh-weight basis) respectively.

Straw and fodder of cereal grains

In Italy lambda-cyhalothrin is registered on barley at a rate of 0.015 kg ai/ha with a PHI of 30 days. Supervised residues trials conducted in Southern Europe according to this GAP were submitted. In barley straw residues were (n = 34): 0.06, 0.08, 0.09(3), 0.11, 0.11, 0.12, 0.13, 0.14, 0.14, 0.15, 0.15, 0.16, 0.16, 0.18, 0.19, 0.21, 0.23, 0.25, 0.28, 0.3, 0.3, 0.31, 0.32, 0.35, 0.4, 0.44, 0.48, 0.51, 0.65, 0.7, 0.82 and 1.2 mg/kg (fresh-weight basis). On a dry weight basis (DM 89%) residues were: 0.07, 0.09, 0.1(3), 0.12, 0.12, 0.13, 0.15, 0.16, 0.16, 0.17, 0.17, 0.18, 0.18, 0.2, 0.21, 0.24, 0.26, 0.28, 0.31, 0.34, 0.34, 0.35, 0.36, 0.39, 0.45, 0.49, 0.54, 0.57, 0.73, 0.79, 0.92 and 1.4 mg/kg.

In France lambda-cyhalothrin is registered on barley at 0.008 kg ai/ha with a PHI of 28 days. Supervised residues trials on barley conducted in Germany according to this GAP were submitted. In barley straw residues were (n = 5): 0.15, 0.25, 0.34, 0.41 and 0.43 mg/kg (fresh-weight basis). On a dry weight basis (DM 89%) residues were: 0.17, 0.28, 0.38, 0.46 and 0.48 mg/kg.

For the use on maize and sweet corn as fodder lambda-cyhalothrin is registered in the United States at 0.034 kg ai/ha with a PHI of 21 days. Supervised residue trials conducted in the US according to this GAP were submitted. In maize fodder residues were (n = 20): < 0.01, < 0.01, 0.05, 0.1, 0.12, 0.13(3), 0.15, 0.18, 0.19, 0.19, 0.2, 0.22, 0.23, 0.23, 0.24, 0.28, 0.34 and 0.4 mg/kg (fresh-weight basis). On a dry weight basis (DM 83%) residues were: < 0.01, < 0.01, 0.06, 0.12, 0.14, 0.16(3), 0.18, 0.22, 0.23, 0.23, 0.24, 0.26, 0.28, 0.28, 029, 0.34, 0.41 and 0.48 mg/kg.

Lambda-cyhalothrin is registered in France for use on oats at 0.008 kg ai/ha with a PHI of 28 days. Supervised residues trials on oats conducted in Germany according to this GAP were submitted. In oat straw residues were (n = 4): 0.04, 0.06, 0.06 and 0.25 mg/kg (fresh-weight basis). On a dry weight basis (DM 90%) residues were: 0.04, 0.07, 0.07 and 0.28 mg/kg.

In the USA lambda-cyhalothrin is registered on rice at 0.045 kg ai/ha with a PHI of 21 days. Supervised residue trials conducted in the US according to this GAP were submitted. In rice straw residues were (n = 16): 0.15, 0.22, 0.23, 0.23, 0.42, 0.43, 0.45, 0.49, 0.49, 0.52, 0.65, 0.85, 0.87, 1.2, 1.4 and 1.4 mg/kg (fresh-weight basis). On a dry weight basis (DM 90%) residues were: 0.17, 0.24, 0.26, 0.26, 0.47, 0.48, 0.5, 0.54, 0.54, 0.58, 0.72, 0.94, 0.97, 1.3, 1.6 and 1.6 mg/kg.

In France lambda-cyhalothrin is registered on rye at 0.008 kg ai/ha with a PHI of 28 days. One supervised residue trial on rye conducted in Germany according to this GAP was submitted. In rye straw residues were (n = 1): 0.1 mg/kg (fresh-weight basis). On a dry weight basis (DM 88%) residues were: 0.11 mg/kg.

In France lambda-cyhalothrin is registered on triticale at 0.008 kg ai/ha with a PHI of 28 days. One supervised residue trial on triticale conducted in Germany according to this GAP was submitted. In triticale straw residues were (n = 1): 0.06 mg/kg (fresh-weight basis). On a dry weight basis (DM 90%) residues were: 0.07 mg/kg.

Lambda-cyhalothrin is registered in the United States for use on wheat at 0.034 kg ai/ha with a PHI of 30 days. Supervised residue trials conducted in the US according to this GAP were submitted. In wheat straw residues were (n = 24): 0.19, 0.21, 0.23, 0.24, 0.26, 0.27, 0.28, 0.29, 0.3, 0.31, 0.33, 0.35, 0.35, 0.36, 0.44, 0.47, 0.5, 0.52, 0.53, 0.7, 0.7, 0.84, 0.92 and 1.3 mg/kg (fresh-weight basis). On a dry weight basis (DM 88%) residues were: 0.21, 0.24, 0.26, 0.27, 0.29, 0.3, 0.31, 0.33, 0.34, 0.35, 0.37, 0.39, 0.39, 0.4, 0.49, 0.53, 0.56, 0.58, 0.6, 0.79, 0.79, 0.94, 1.0 and 1.5 mg/kg.

In France lambda-cyhalothrin is registered on wheat at 0.008 kg ai/ha with a PHI of at least 28 days. Supervised residues trials on wheat conducted in Germany according to this GAP were submitted. In wheat straw residues were (n = 9): 0.1, 0.11, 0.16, 0.2, 0.26, 0.34, 0.41, 0.42 and

0.61 mg/kg (fresh-weight basis). On a dry weight basis (DM 88%) residues were: 0.11, 0.12, 0.18, 0.22, 0.29, 0.38, 0.46, 0.47 and 0.69 mg/kg.

The Meeting noted that residues in cereal straw and fodder crops were of the same magnitude and decided to make recommendations for the whole group of straw and fodder of cereal grains. From the data population for rice straw according to US GAP that resulted in the highest residues, the Meeting estimated a maximum residue level, an STMR value and a highest residue value for lambda-cyhalothrin in straw and fodder of cereal grains (dry-weight bases) of 2, 0.54 and 1.6 mg/kg respectively.

Almond hulls

Lambda-cyhalothrin is registered in the United States for use on almonds at 0.045 kg ai/ha with a PHI of 14 days. Supervised residue trials conducted in the US according to this GAP were submitted. In almond hulls residues were (n = 5): 0.29, 0.34, 0.38, 0.49 and 1.0 mg/kg (fresh-weight basis). On a dry weight basis (DM 90%) residues were: 0.32, 0.38, 0.42, 0.54 and 1.1 mg/kg.

The Meeting estimated a maximum residue level and a STMR value for lambda-cyhalothrin in almond hulls (dry-weight bases) of 2 and 0.42 mg/kg respectively.

Fate of residues during processing

The Meeting received information on the fate of lambda-cyhalothrin residues during processing of oranges, apples, peaches, plums, strawberries, currants, grapes, olives, tomatoes, spinach, beans, wheat, sorghum, rice sugarcane, soya beans and cotton seeds. Also information was provided on hydrolysis studies of lambda-cyhalothrin to assist with identification of the nature of the residue during processing. Processing factors presented below have been calculated for lambda-cyhalothrin for all commodities relevant to trade and/or the dietary intake estimation. Further data on processed commodities are presented in the evaluation for this active substance.

Lambda-cyhalothrin was stable under the hydrolysis condition (pH, temperature, time) representing the food processes pasteurisation, baking, brewing, boiling and sterilisation.

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors	Median or best estimate
Oranges	juice	< 0.14, < 0.33	< 0.33
	wet pomace	1.6, 2	1.8
	dry pomace	3.9, 6.3	5.2
Apples	juice	< 0.1	<1
	wet pomace	< 1, 8.1	8.1
Grapes	raisins	3, 3	3
	wet pomace (white wine)	3.5	3.5
	wet pomace (red wine)	5.5	5.5
	dry pomace (white wine)	11	11
	dry pomace (red wine)	15	15
	young wine (white & red wine)	< 0.5, < 0.5	< 0.5
	juice (white & red)	< 0.5, < 0.5	< 0.5
Olives	virgin oil	0.46, 1	0.73
Tomatoes	juice	0.06	0.06
	paste	0.31	0.31
Wheat	bran	4.5	4.5

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors	Median or best estimate
	middlings	1.0	1.0
	shorts & germs	1.5	1.5
	patent flour	0.5	0.5
	grain dust (< 420µ)	98	98
Rice	polished rice	< 0.01	< 0.01
	hulls	6.5	6.5
	bran	0.22	0.22
Sugarcane	molasses	< 0.05	< 0.05
	refined sugar	< 0.05	< 0.05
Soya beans	hulls	< 1	< 1
	meal	< 1	< 1
	refined oil	< 1	< 1
Cottonseed	delinted seed	0.1	0.1
	hulls	0.1	0.1
	meal	< 0.1	< 0.1
	refined oil	0.1	0.1

Oranges were processed into juice and wet and dry pomace. Processing factors were < 0.33, 1.8 and 5.2 respectively. Based on the median residue of 0.05 mg/kg for whole oranges STMR-P values for lambda-cyhalothrin residues were 0.0165 mg/kg in orange juice, 0.09 mg/kg in wet pomace and 0.26 mg/kg in dry pomace.

Apples were processed into juice and wet pomace. Processing factors were < 0.1 for juice and 8.1 for wet pomace. Based on the STMR value of 0.08 mg/kg for pome fruit STMR-P values for lambda-cyhalothrin residues were 0.008 mg/kg for apple juice and 0.65 mg/kg for wet pomace.

Grapes were processed into wine, juice, raisins and wet and dry pomace. Processing factors were 0.5 for wine and juice (red and white combined), 3 for raisins and 5.5 and 15 for wet and dry pomace (based on red wine) respectively. Based on the STMR value of 0.02 for grapes STMR-P values were 0.01 mg/kg for wine and juice (red and white combined), 0.06 mg/kg for raisins and 0.11 mg/kg and 0.3 mg/kg for wet and dry pomace, respectively.

Based on the HR of 0.09 mg/kg estimated for grapes and the processing factor of 3 for raisins, the Meeting estimated a maximum residue level of 0.3 mg/kg, an STMR of 0.06 and an HR of 0.27 mg/kg for lambda-cyhalothrin in dried grapes, respectively.

Olives were processed into virgin oil. The processing factor was 0.73. Based on the STMR value of 0.125 mg/kg for olives STMR-P value was 0.091 mg/kg for virgin oil.

Tomatoes were processed into juice and paste. Processing factors were 0.06 for juice and 0.31 for paste, respectively. Based on the STMR value of 0.03 mg/kg for tomatoes STMR-P values were 0.002 mg/kg for tomato juice and 0.007 mg/kg for paste, respectively.

Wheat was processed into bran, middlings, patent flour and grain dust. Processing factors were 4.5 for bran, 1 for middlings, 0.5 for flour (patent flour) and 98 for grain dust. Based on the STMR value of 0.01 mg/kg for wheat grain STMR-P values were 0.045 mg/kg for bran, 0.01 mg/kg for middlings, 0.005 mg/kg for flour and 0.98 mg/kg for grain dust.

Based on the STMR found in wheat grain of 0.01 mg/kg and a processing factor of 4.5 for wheat bran the Meeting estimated a maximum residue level of 0.1 mg/kg for wheat bran.

Rice was processed into polished rice, hulls and bran. Processing factors were < 0.01, 6.5 and 0.22 respectively. Based on the STMR value of 0.295 mg/kg for rice grain STMR-P values were 0.003 mg/kg for polished rice, 1.9 mg/kg for rice hulls and 0.065 mg/kg for rice bran.

Sugarcane was processed into molasses and refined sugar. Processing factors were < 0.05 and < 0.05, respectively. Based on the STMR value of 0.02 mg/kg for sugar cane STMR-P values were 0.001 mg/kg for molasses and refined sugar.

Soya beans were processed into hulls, meal and refined oil. In all cases the processing factors were < 1. Specific STMR-P values for lambda-cyhalothrin in soya beans can not be estimated.

Cottonseed was processed into delinted seed, hulls, meal and refined oil. Processing factors were 0.1 for delinted seeds, 0.1 for hulls, < 0.1 for meal and 0.1 for refined oil. Based on the STMR value of 0.01 mg/kg for cottonseeds STMR-P values were 0.001 for delinted seeds, 0.001 for hulls, 0.001 for meal and 0.001 for refined oil.

Farm animal dietary burden

The Meeting received lactating dairy cow feeding studies which provided information on likely residues resulting in animal tissues and milk from lambda-cyhalothrin residues in the animal diet.

Lactating dairy cows

Lactating Friesian dairy cows between four and nine years old were fed for up to 30 days on diets containing approximately 1, 5 and 25 ppm lambda-cyhalothrin. The lambda-cyhalothrin was incorporated into molasses, which was added to the concentrate feed at each of the twice-daily milking times. Each feeding group contained at least three cows; the 25 mg/kg group contained five cows. At the lowest dose level of 1 ppm no residues above the LOQ of 0.01 mg/kg were detected in meat. Liver and kidney gave small measurable residues at 0.03 mg/kg and 0.02 mg/kg respectively. Most of the residue was found in fat, ranging up to 0.5 mg/kg.

In the 5 ppm dose group comparable results were obtained. Residues in muscle, liver and kidney were in the range of 0.01 to 0.07 mg/kg. In fatty tissues lambda-cyhalothrin accumulated to a level up to 1.8 mg/kg. At the highest dose rate of 25 mg/kg residues were relatively high. Meat contained lambda-cyhalothrin resides up to 0.4 mg/kg. In liver lower residues compared to kidney were detected (0.08 mg/kg and 0.4 mg/kg respectively). Most of the residue was found in fat ranging from 1.3 up to 7.2 mg/kg.

Tissues from cows in the 25 mg/kg group that were allowed a recovery period on untreated diet of one week contained significantly lower residues of < 0.01–0.05 mg/kg (meat), < 0.01 mg/kg (liver), 0.10–0.20 mg/kg (kidney) and 0.03–2.6 mg/kg (fat).

In the milk residues reached a plateau after a dosing period of 10 to 12 days in all dose groups. For the feeding levels of 1, 5 and 25 ppm average residues in milk were 0.03, 0.1 and 0.83 mg/kg, respectively. No separation between cream and skim milk was conducted.

In a second study lactating Holstein dairy cows between four and six years old were fed for 28 days on diets containing approximately 8, 25 and 60 ppm lambda-cyhalothrin (administered as gelatine capsules). Each feeding group contained at least four cows. At the lowest dose group of 8 ppm lambda-cyhalothrin in the diet, residues were relatively low (< 0.01–0.09 mg/kg for liver and 0.02–0.08 mg/kg in kidney). Over the whole dosage interval up to 60 mg/kg in the diet, an increase in the residue up to 0.09 mg/kg in liver and 0.3 mg/kg in kidney was observed. Residues levels of compound Ia were comparable to lambda-cyhalothrin.

Estimated maximum and mean dietary burdens of farm animals

Dietary burden calculations for beef cattle, dairy cattle, broilers and laying poultry are presented in Annex 6 of the 2008 Report of the JMPR. The calculations were made according to the livestock diets from US–Canada, EU and Australia in the OECD Table (Annex 6 of the 2006 Report of the JMPR).

	Livestock dietary burden, lambda-cyhalothrin, ppm of dry matter diet					
	US-Canada		EU		Australia	
	max.	mean	max.	mean	max.	mean
Beef cattle	4.07	2.83	5.93	4.03	6.12	4.05
Dairy cattle	4.55	3.1	4.79	3.27	6.12[a]	4.07[b]
Poultry - broiler	0.65	0.65	0.25	0.25	0.40	0.40
Poultry - layer	0.65	0.65	1.09	0.74	0.40	0.40

a Highest maximum beef or dairy cattle burden suitable for MRL estimates for mammalian meat and milk

b Highest mean beef or dairy cattle burden suitable for STMR estimates for mammalian meat and milk

Animal commodities, MRL estimation

For MRL estimation, the residues in the animal commodities are lambda-cyhalothrin. The residue is fat-soluble.

Cattle

For MRL estimation, the high residues in the tissues were calculated by interpolating the maximum dietary burden (6.12 ppm) between the relevant feeding levels (5 and 25 ppm) from the dairy cow feeding study and using the highest tissue concentrations from individual animals within those feeding groups. Only the feeding study conducted at rates of 1, 5 and 25 ppm was used for the estimation, since the second study available has a lowest dose of 8 ppm, which is higher than the maximum dietary burden for beef and dairy cattle.

The STMR values for the tissues were calculated by interpolating the mean dietary burden (4.07 ppm) between the relevant feeding levels (1 and 5 ppm) and using the mean tissue concentration from each feeding group.

In the table below, dietary burdens are shown in round brackets (), feeding levels and residue concentrations from the feeding studies are shown in square brackets [] and estimated concentrations related to the dietary burden are shown without brackets.

Dietary burden (ppm) Feeding level [ppm]	Milk	Muscle	Liver	Kidney	Fat
MRL					
	mean	highest	highest	highest	highest
MRL beef or dairy cattle (6.12) [5, 25]	0.12 [0.1, 0.57]	0.1 [0.07, 0.4]	0.02 [0.01, 0.08]	0.09 [0.07, 0.4]	2.2 [1.8, 7.2]
STMR					
	mean	mean	mean	mean	mean
STMR beef or dairy cattle (4.07) [1, 5]	0.08 [0.03, 0.1]	0.04 [0.01, 0.05]	0.008 [0.03, 0.01]	0.03 [0.01, 0.04]	1.0 [0.25, 1.3]

The data from the cattle feeding study were used to support mammalian meat and milk MRLs.

The Meeting estimated a maximum residue level for lambda-cyhalothrin in whole milk of 0.2 mg/kg. No information was available on the distribution of residue between fat and non-fat milk fractions.

The residue arising from a dietary burden of 6.12 ppm was 2.2 mg/kg in the fat. Since the target tissue for lambda-cyhalothrin residues in animal tissues is fat, the Meeting recommended a maximum residue level of 3 mg/kg for meat (on a fat basis) and fat.

For kidney and liver the interpolation between the 5 and 25 ppm dose group lead to estimates of 0.09 mg/kg and 0.02 mg/kg respectively. On basis of the estimates, the Meeting recommended maximum residue levels of 0.2 mg/kg for kidney and 0.05 mg/kg for liver. All maximum residue levels recommended for animal commodities represent higher values as compared to those currently established in the Codex system by JECFA.

For dietary risk assessment, the STMR values are 0.08 mg/kg for whole milk, 1.0 mg/kg for meat/fat, 0.04 mg/kg for muscle, 0.03 mg/kg for kidney and 0.008 mg/kg for liver. The estimated HR values were 2.2 mg/kg for meat/fat, 0.1 mg/kg for muscle, 0.09 mg/kg for kidney and 0.02 mg/kg for liver. For liver residue data did not scale according to the dosing level in the feed. The Meeting decided to use the values for the dose level of 5 ppm as a basis for the estimation instead of the values at 1 ppm, since the residue data from higher dose rates seem to reflect a more realistic transfer into the liver of the animals.

For poultry no livestock feeding studies using lambda-cyhalothrin were submitted to the Meeting. A recommendation for maximum residue levels as well as for STMR and HR values is not possible.

RECOMMENDATIONS

The Meeting estimated the STMR, HR and MRL values shown below. For head cabbage the prospective approach of an alternative GAP was used.

Definition of the residue (for compliance with MRL and for estimation of dietary intake) for plant and animal commodities*: cyhalothrin, sum of isomers*

The residue is fat soluble.

Based on the evaluation of residue data for lambda-cyhalothrin as a replacement for cyhalothrin currently established Codex MRLs for head cabbage, cotton seeds, cotton seed crude oil, cotton seed refined oil and potato are withdrawn by the Meeting. The MRL for pome fruit of 0.2 mg/kg is confirmed by the Meeting.

For animal commodities Codex MRLs are currently established by CCRVDF for cattle (0.02 mg/kg for muscle, liver and kidney, 0.4 mg/kg for fat and 0.03 mg/kg for milk), pig (0.02 mg/kg for muscle, liver and kidney and 0.4 mg/kg for fat) and sheep (0.02 mg/kg for muscle and kidney, 0.05 mg/kg for liver and 0.4 mg/kg for fat). Maximum residues levels for animal commodities were recommended by JMPR at a higher level compared to the Codex MRLs already established.

CCN	Commodity	Recommended MRL mg/kg		STMR or STMR-P mg/kg	HR or HR-P mg/kg
		New	Previous		
AB 0660	Almond hulls	2		0.42	
JF 0226	Apple, juice			0.008	-
FS 0240	Apricots	0.5	-	0.1	0.33
VS 0621	Asparagus	0.02	-	0.01	0.01
GC 0640	Barley	0.5	-	0.02	-
FB 0018	Berries and other small fruits	0.2	-	0.02	0.09
VA 0035	Bulb vegetables	0.2	-	0.05	0.11
VB 0041	Cabbages, Head	0.3	0.2	0.08	0.17
FS 0013	Cherries	0.3	-	0.125	0.18

CCN	Commodity	Recommended MRL mg/kg		STMR or STMR-P mg/kg	HR or HR-P mg/kg
		New	Previous		
FC 0001	Citrus fruits	0.2	-	0.01	0.01
OC 0691	Cotton seed, crude oil	W	0.02*	0.005	-
OR 0691	Cotton seed, refined oil	W	0.02*	0.001	-
SO 0691	Cotton seeds	W	0.02*	0.01	
DF 0269	Dried grapes (= currants, Raisins and Sultanas)	0.3	-	0.06	0.27
VB 0042	Flowerhead brassica	0.5	-	0.215	0.3
VC 0045	Fruiting vegetables, Cucurbits	0.05	-	0.01	0.02
VO 0050	Fruiting vegetables, other than Cucurbits except Mushrooms	0.3	-	0.03	0.18
JF 0269	Grape, juice			0.01	-
MO 0098	Kidney of cattle, goats, pigs and sheep	0.2	-	0.03	0.09
VP 0060	Legume vegetables	0.2	-	0.02	0.11
MO 0099	Liver of cattle, goats, pigs and sheep	0.05	-	0.008	0.02
GC 0645	Maize	0.02	-	0.01	
FI 0345	Mango	0.2	-	0.03	0.07
MM 0095	Meat (from mammals other than marine mammals)	3 (fat)	-	0.04 (muscle) 1 (fat)	0.1 (muscle) 2.2 (fat)
ML 0106	Milks	0.2	-	0.08	-
FS 0245	Nectarine	0.5	-	0.1	0.33
GC 0647	Oats	0.05	-	0.01	
SO 0088	Oilseeds	0.2	-	0.01	-
OR 0305	Olive oil, refined			0.077	-
OR 0305	Olive oil, virgin			0.091	-
FT 0305	Olives	1	-	0.125	0.42
JF 0004	Orange, juice			0.0165	-
-	Orange, marmalade			0.05	-
FS 0247	Peaches	0.5	-	0.1	0.33
HS 0444	Peppers, chili (dried)	3	-	0.35	1.5
FS 0014	Plums, except prunes	0.2	-	0.02	0.1
FP 0009	Pome fruits	0.2	0.2	0.08	0.1
VR 0589	Potato	W	0.02*	0	0
VD 0070	Pulses	0.05	-	0.01	
GC 0649	Rice	1	-	0.295	
CM 0649	Rice bran, unprocessed			0.065	-
CM 1205	Rice, polished			0.003	-
VR 0075	Root and tuber vegetables	0.01*	-	0	0
GC 0650	Rye	0.05	-	0.01	

CCN	Commodity	Recommended MRL mg/kg		STMR or STMR-P mg/kg	HR or HR-P mg/kg
		New	Previous		
AS 0081	Straw and fodder (dry) of cereal grains	2 dw		0.54 dw	
GS 0659	Sugar cane	0.05	-	0.02	0.03
DM 0659	Sugar cane, molasses			0.001	-
-	Sugar cane, refined sugar			0.001	-
JF 0048	Tomato, juice			0.002	-
VW 0448	Tomato, paste			0.007	-
TN 0085	Tree nuts	0.01*	-	0.01	0.01
GC 0653	Triticale	0.05	-	0.01	
GC 0654	Wheat	0.05	-	0.01	0.03
CF 0654	Wheat bran, unprocessed	0.1	-	0.045	-
CF 1211	Wheat, flour			0.005	-
-	Wine			0.01	-
AB 1230	Apple pomace, wet			0.65	
-	Barley, forage			0.49	1.4
AB 1203	Cotton seed, meal			0.001	
AB 0269	Grape pomace, dry			0.3	
AF 0645	Maize, forage			1.85	2.8
AF 0647	Oats, forage			0.49	1.4
-	Orange pomace, dry			0.26	
-	Peanut hay	-		1.3	2.2
CM 1207	Rice, hulls			1.9	
AF 0650	Rye, forage			0.49	1.4
AF 0651	Sorghum, forage			0.49	1.4
-	Wheat, forage			0.49	1.4

DIETARY RISK ASSESSMENT

Long-term intake

The evaluation of lambda-cyhalothrin resulted in recommendations for MRLs and STMR values for raw and processed commodities. Where data on consumption were available for the listed food commodities, dietary intakes were calculated for the 13 GEMS/Food Consumption Cluster Diets. The results are shown in Annex 3 of the 2008 Report of the JMPR.

The IEDIs in the thirteen Cluster Diets, based on the estimated STMRs were 3–10% of the maximum ADI (0.02 mg/kg bw). The Meeting concluded that the long-term intake of residues of lambda-cyhalothrin from uses that have been considered by the JMPR is unlikely to present a public health concern.

Short-term intake

The International Estimated Short-term Intake (IESTI) for lambda-cyhalothrin was calculated for the food commodities for which STMRs or HRs were estimated and for which consumption data were available. The results are shown in Annex 4 of the 2008 Report of the JMPR.

The IESTI calculated on the basis of the recommendations made by the JMPR represented 0–60% of the ARfD (0.02 mg/kg bw) for children and 0–40% for the general population.

For head cabbage the prospective approach of an alternative GAP was used.

The Meeting concluded that the short-term intake of residues of lambda-cyhalothrin resulting from uses that have been considered by the JMPR is unlikely to present a public health concern.

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