		Official use only
Reference point in dossier	**7.1.2.2.2/04**	
Title:	*Lambda*-Cyhalothrin : Adsorption and Desorption in Aquatic plants	
Project/Report number:	RJ2716B	
Author(s):	Kuet S F	
Date of report:	1998	
Published:	No	
Testing facility:	Jealott's Hill Research Station, Bracknell, Berkshire, UK	
Test substance:	^{14}C-cyclopropane *lambda*-Cyhalothrin, radiochemical purity [redacted]	X1
Study dates	June 1998 to August 1998	
GLP:	Yes	
Reliability indicator	1	

	Official use only
Materials and methods: The two studies so far described were conducted under laboratory conditions. The systems used did not contain any aquatic macrophytes, which can have a significant influence on the fate on a highly lipophilic compound such as *lambda*-Cyhalothrin. The following series of studies were, therefore, conducted to elucidate the role of aquatic macrophytes on the fate of *lambda*-Cyhalothrin in aquatic systems. In the first study, the adsorption and desorption properties of *lambda*-Cyhalothrin were measured for two species of aquatic macrophytes, namely *Ceratophyllum demersum* (a compound-leaved species) and *Potamogeton crispus* (a broad-leaved species) at a plant:water ratio of approximately 1:20 (w/v). ^{14}C-*lambda*-Cyhalothrin was applied to the aqueous phase of each system at a concentration of 5 ug/l. After shaking for 2 hours to achieve equilibrium, the concentrations of *lambda*-Cyhalothrin in the aqueous and macrophyte compartments were determined. **Findings:** Average adsorption and desorption partition coefficients for each macrophyte species were calculated and are summarised below. Adsorption to these species of aquatic macropyhtes was rapid and extensive. It was also shown to be not entirely reversible. The mass balances for both species were > 94% of the applied radioactivity. No significant degradation was observed in either the aqueous or macrophyte phases during the 2 hour experimental period.	X2 X3 X4 X5 X6, X7

Species	**Partition Coefficient**	
	Adsorption	**Desorption**
Ceratophyllum demersum	1100	3900
Potamogeton crispus	1800	6500

	Evaluation by Competent Authorities
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	Not relevant
Materials and Methods	[redacted]

	[redacted]
Results and discussion	[redacted]
Conclusion	[redacted]
Reliability	[redacted]
Acceptability	[redacted]
Remarks	[redacted]

		Official use only
Reference point in dossier	**7.1.2.2.2/05**	
Title:	*Lambda*-Cyhalothrin : Metabolism in Aquatic Plants	
Project/Report number:	RJ2626B	
Author(s):	Hand, L.H. and Mehta, P.	
Date of report:	1998a	
Published:	No	
Testing facility:	Jealott's Hill Research Station, Bracknell, Berkshire, UK	
Test substance:	^{14}C-cyclopropane *lambda*-Cyhalothrin, radiochemical purity [redacted]	X1
Study dates	April 1998 to June 1998	
GLP:	Yes	
Reliability indicator	1	

	Official use only
Materials and methods: The potential for extensive adsorption of *lambda*-Cyhalothrin to aquatic macrophytes had been clearly demonstrated. The following study was, therefore, conducted to investigate the potential for, and route of, degradation of adsorbed *lambda*-Cyhalothrin in, or on, aquatic macrophytes. ^{14}C-cyclopropyl *lambda*-Cyhalothrin was applied to beakers, each containing 400 mL Hoagland's nutrient solution and the following aquatic macrophyte species, *Ceratophyllum demersum*, *Potamogeton crispus* and *Cladophora spp* (a filamentous alga) at a density of approximately 3 g wet weight per experiment. In addition, the *Ceratophyllum* experiment was performed at a higher density equivalent to 3 x that used in the other experiments. The *lambda*-Cyhalothrin application rate was approximately 2 ug/l (equivalent to a surface application of 6 g ai/ha to a 30cm deep body of water). At 1, 8 and 14 days after application, beakers were removed and the plants were separated from the aqueous compartment. These were separately quantified, fractionated and analysed chromatographically to determine the extent of adsorption to the plant surfaces and degradation of the applied chemical.	X2 X3
Findings: *Lambda*-Cyhalothrin was rapidly adsorbed to the plants with an estimated DT_{50} for dissipation from the water phase of less than 1 day. The concentration of *lambda*-Cyhalothrin in the plants increased initially but was subsequently degraded via ester cleavage to yield the cyclopropane acid metabolite (Compound Ia) which was released back into the aqueous phase, reaching a maximum of 50% after 14 days. No *lambda*-Cyhalothrin was observed in the aqueous compartment after 8 days.	X4

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	Not relevant
Materials and Methods	[redacted]
Results and discussion	[redacted]
Conclusion	[redacted]

	[redacted]
Reliability	[redacted]
Acceptability	[redacted]
Remarks	[redacted]

		Official use only
Reference point in dossier	**7.1.2.2.2/06**	
Title:	*Lambda*-Cyhalothrin : Degradation in an Aquatic Microcosm	
Project/Report number:	RJ2730B	
Author(s):	Hand, L.H. and Mehta, P.	
Date of report:	1998b	
Published:	No	
Testing facility:	Jealott's Hill Research Station, Bracknell, Berkshire, UK	
Test substance:	^{14}C-cyclopropane *lambda*-Cyhalothrin, radiochemical purity [redacted]	X1
Study dates	July 1998 to October 1998	
GLP:	Yes	
Reliability indicator	1	

	Official use only
Materials and methods: A further study was conducted to investigate the fate of *lambda*-Cyhalothrin in aquatic environments under semi-realistic conditions.	X2
An aquatic microcosm was established in a large glass tank (2 m x 1 m x 0.5 m high). The system contained pond sediment to an average depth of approximately 10 cm and pond water to a depth of 30 cm. The microcosm was allowed to establish for approximately 6 weeks until a natural plant community had developed (mainly *Chara spp.*).	X3
The key physico-chemical properties of the sediment and the overlying water are shown in the following tables.	
^{14}C-cyclopropyl *lambda*-Cyhalothrin was applied evenly across the surface of the water to provide an initial aqueous concentration of 2.3 ug/l (assuming even distribution throughout the water column). This was equivalent to the concentration that would result from an application to the water surface of approximately 7 g ai/ha. The microcosm was maintained in a glasshouse and the water temperature was controlled at approximately 12°C to 17°C using a heat exchanger. At 3, 6, 10, 24, 48 and 96 hours after application, sub-samples of water were removed for quantification of total radioactivity. Also, at 24, 48 and 96 hours sub-samples of plants and sediment were removed and quantified. All samples were fractionated and analysed chromatographically to investigate the degradation of the applied chemical.	X4 X5 X6 X7
Findings: *Lambda*-Cyhalothrin was dissipated rapidly from the water column and degraded by cleavage of the ester bond to generate one major metabolite, namely the cyclopropane acid metabolite (Compound Ia), which reached a maximum of 40% in the aqueous compartment after 96 hours. At this time the level of *lambda*-Cyhalothrin present in the aqueous compartment was only 1.4% of applied. Low levels of Compound Ia were also observed in the sediment	

(≤ 1.4% of applied), but none was observed in the macrophytes, presumably due to its rapid release back into the water. The maximum levels of *lambda*-Cyhalothrin found in the macrophytes and sediment were 4.3% (after 24 hours) and 5.3% (after 48 hours) respectively. Losses from the microcosm (up to 40% of applied radioactivity after 96 hours) were attributed to mineralisation to CO_2. The kinetics of the dissipation process was determined using a First Order Multi-Compartment (FOMC) model. The results are shown in the following tables. Dissipation of *lambda*-Cyhalothrin in a semi-realistic aquatic environment was very rapid, with a DT_{50} of < 3 hours. This was predominantly due to adsorption to both sediment and aquatic macrophytes. Once adsorbed, degradation of *lambda*-Cyhalothrin was also rapid, particularly on the macrophytes (total system DT_{90} of 56 hours). This rapid degradation ensured that the chemical was not only rapidly removed from the water column, but also from the total system.	X8 X9 X10

Sediment		**Water (measured one week before application)**	
Property	**Value**	**Property**	**Value**
pH	7.6	pH	9.83
% Organic Matter	5.8	Turbidity	11.2 NTU
Classification	Sandy Clay Loam	Dissolved O_2	154 % Sat

	DT_{50} (Hours)	**DT_{90} (Hours)**
Aqueous Compartment	< 3	19
Total System	< 3	56

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	Not relevant
Materials and Methods	[redacted]

	[redacted]
Results and discussion	[redacted]

	[redacted]
Conclusion	[redacted]
Reliability	[redacted]
Acceptability	[redacted]
Remarks	[redacted]

98/8 Doc IIIA section No.	7.1.3	Adsorption/desorption screening test

	JUSTIFICATION FOR NON-SUBMISSION OF DATA	Official use only
Other existing data [X] Limited exposure [ ]	Technically not feasible [ ] Scientifically unjustified [ ] Other justification [ ]	
Detailed justification:	[redacted]	
Undertaking of intended data submission [ ]		
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	Not relevant	
Evaluation of applicant's justification	[redacted]	
Conclusion	[redacted]	
Remarks		

98/8 Doc IIIA section No.	7.1.4.1	Field study on accumulation in the sediment

JUSTIFICATION FOR NON-SUBMISSION OF DATA		Official use only
Other existing data [X] Limited exposure [ ]	Technically not feasible [ ] Scientifically unjustified [ ] Other justification [ ]	
Detailed justification:	[redacted]	
Undertaking of intended data submission [ ]		
Evaluation by Competent Authorities		
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	Not relevant	
Evaluation of applicant's justification	[redacted]	
Conclusion	[redacted]	
Remarks		

98/8 Doc IIIA section No.	**7.2.1**	**Aerobic degradation in soil, initial study**
91/414 Annex IIA point addressed	**7.1.1.1.1**	**Aerobic degradation in soil**

		Official use only
Reference point in dossier	**7.2.1/01**	
Title:	PP563 and PP321 : Degradation in Soil	
Project/Report number:	RJ0382B	
Author(s):	Bharti, H., Bewick, D.W., White, R.D.	
Date of report:	1985	
Published:	No	
Testing facility:	Jealott's Hill Research Station, Bracknell, Berkshire, UK	
Test substance:	^{14}C-cyclopropane Cyhalothrin and ^{14}C-cyclopropane *lambda*-cyhalothrin, radiochemical purity, [redacted] respectively	X1
Study dates	May 1983 to August 1984	
GLP:	Yes	
Reliability indicator	1	

	Official use only
Materials and methods: Cyhalothrin and *lambda*-Cyhalothrin, radiolabelled in the cyclopropane ring, were separately applied at the nominal rate of 100 g ai/ha to a sandy loam soil ("18 Acres") and incubated in dark enclosed systems, at 20°C, in a stream of moist air. Soil was incubated with the moisture content adjusted to 40% of maximum water holding capacity. Additional incubations were carried out, which monitored the fate of Cyhalothrin at reduced temperature (10°C), higher rates of application (500 g ai/ha), flooded (anaerobic) conditions and in an alternate, loamy sand soil („Frensham"). Soil characteristics are shown in the following table. **Findings:** The rapid and extensive degradation of the ^{14}C-cyclopropane-labelled test materials under aerobic conditions was demonstrated by the extent of mineralisation observed during the study (up to 70.4% evolved $^{14}CO_2$ after 180 days). The major extractable degradation products were the hydroxylated parent material (Compound XV) and the ester hydrolysis product (Compound Ia) which represented up to 12.1% and 7.6% of the applied material, respectively, between 14 and 63 days after application, and thereafter declined. The separate monitoring of the fate of *lambda*-Cyhalothrin, showed that racemisation of the enantiomers at the α-carbon, was not an important pathway in soil. „Bound", or unextractable material, was seen to increase during the early stages of aerobic incubation, but reached a plateau at *ca* 20% of the applied material, around 60 days after application. The route of metabolism was not affected by the changes in study conditions with the exception that only a limited amount of carbon dioxide was evolved under anaerobic (flooded) conditions.	X2 X3 X4 X5 X6 X7 X8 X9

Cyhalothrin degraded with a half-lifes of 22 and 82 days in "18 Acres" sandy loam and „Frensham" loamy sand, respectively following application at 100 g ai/ha and incubation under aerobic conditions at 20°C. Increasing the application rate to 500 g ai/ha in sandy loam soil, or reducing the incubation temperature to 10°C reduced the rate of degradation, with half-lives of 42 and 56 days obtained, respectively. Under anaerobic conditions a half-life of 74 days was observed in flooded sandy loam soil.	X10

Characterisation of soils used to determine the rate of degradation of Cyhalothrin and *lambda*-Cyhalothrin

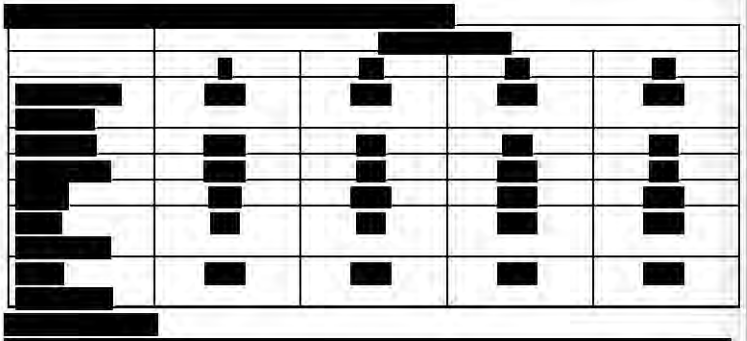
	pH	OM (%)	Clay Content (%)	Soil Type (New Jersey System)
"18 Acres"	6.7-6.8	4.0-4.6	22.0	sandy loam
„Frensham"	5.3	2.0	10.0	loamy sand

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	Not relevant
Materials and Methods	[redacted]

[redacted]

Results and discussion

[redacted]



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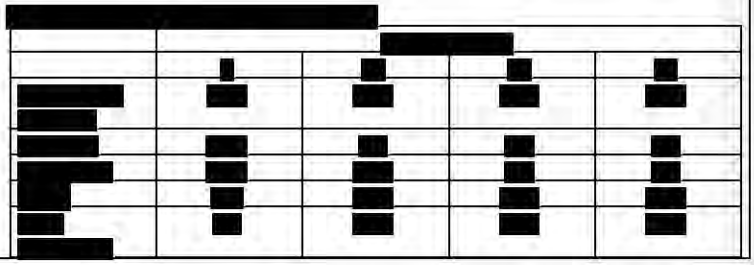

	[redacted]
Conclusion	[redacted]

	[redacted]
Reliability	[redacted]
Acceptability	[redacted]
Remarks	[redacted]

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.1/02	**Aerobic degradation in soil, initial study**	
	1. REFERENCE	
1.1 Reference	Völkel, W. (2005a). Tefluthrin: Degradation of PP890, a Metabolite of Tefluthrin and *Lambda* Cyhalothrin in Three Soils Incubated Under Aerobic Conditions. RCC unpublished report number 856646	
1.2 Data protection	Yes	
1.2.1 Data owner	Syngenta	
1.2.2 Companies with letter of access	[redacted]	
1.2.3 Criteria for data protection	[redacted]	
	2. GUIDELINES AND QUALITY ASSURANCE	
2.1 Guideline study	Yes. Study conducted to OECD 307 guidelines.	
2.2 GLP	Yes.	
2.3 Deviations	None.	
	3. MATERIALS AND METHODS	
3.1 Test material (radiolabelled)	Not applicable.	
3.1.1 Lot/Batch number	Not applicable.	
3.1.2 Specification	Not applicable.	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.1/02	**Aerobic degradation in soil, initial study**	
3.1.3 Purity	Not applicable.	
3.1.4 Further relevant properties	Not applicable.	
3.2 Test material (non radiolabelled)	PP890 (1RS)-cis-3-(Z-2-chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropanecarboxylic acid	X1
3.2.1 Lot/Batch number	[redacted]	
3.2.2 Specification	None stated.	
3.2.3 Purity	[redacted]	
3.2.4 Further relevant properties	None stated.	
3.3 Reference Materials (non radiolabelled)	None stated.	
3.3.1 Lot/Batch number	Not applicable.	
3.3.2 Purity	Not applicable.	
3.4 Test performance	The rate of aerobic degradation of PP890 was investigated in three soil types (a sandy clay loam and two loam soils) in the dark under laboratory conditions at 20°C and a moisture content of either pF2 or 40% maximum water holding capacity (MWHC).	
3.4.1 Test soils	A summary of the characterisation information for the soils used is provided in the following tables.	
3.4.2 Treatment to soil samples	An aliquot (1 mL) of an aqueous solution containing 12.3 µg/mL of PP890 was applied dropwise to samples of each soil (100 g dry weight). Application was equivalent to a field rate of 100 g/ha assuming an even distribution in the top 5 cm layer and a soil density of 1.5 g/cm^3. After treatment the soils were gently mixed by swirling the flask.	
3.4.3 Incubation of soil samples	Treated soil samples were incubated in the dark at 20°C. The „18 Acres" and „Gartenaker" soils were maintained at a soil moisture content of pF2, the „Marsillargues" soil was maintained at a moisture content of 40% MWHC. Duplicate samples were removed for analysis at the following intervals: 0, 1, 3, 7, 14, 21 and 28 days for the „18 Acres „soil, 0, 1, 3, 7, 9, 14 and 21 days for the „Gartenaker" soil and 0, 3, 7, 14, 21, 28, 43 and 73 days for the „Marsillargues" soil. After sampling, the soils were extracted with acetonitrile: water (4:1 v/v, 4 x 100 mL) and the extracts analysed by LC/MS. The extraction method was validated by analysing PP890 fortified control soil samples.	X2 X3
3.4.4 Chromatographic analysis	LC/MS analysis was performed using a reversed phase HPLC method (Phenomenex Luna C_{18} column with gradient elution using acetonitrile and water as the mobile phase) and negative ion electrospray ionisation.	
3.5 Degradation	Degradation was determined using non-linear first-order kinetics	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.1/02	**Aerobic degradation in soil, initial study**	
kinetics	using the mean of the duplicate samples taken at each interval. DT_{50} and DT_{90} values were calculated using MicroCal Software.	
	4. RESULTS	
4.1 Recovery and distribution	The recovery of fortified control samples was between 76.5 and 108.7% of applied. Mean recoveries were 94.8, 99.5 and 86.6% of applied for the „18 Acres", „Gartenaker" and „Marsillargues" soils, respectively. The method used was therefore considered valid.	X4
4.2 Profile of components	Not determined.	
4.3 Route of degradation	Not determined.	
4.4 Rate of degradation	The level of PP890 remaining in each soil type at each sampling interval is shown in the following tables. The level of PP890 remaining after 7 days had declined to 20.6, 38.7 and 70.3% of applied in „18 Acres", „Gartenaker" and „Marsillargues" soils, respectively and the decline continued such that <3.4, <1.8 and <1.0% of applied remained after 28, 21 and 73 days for the three soils, respectively. The resulting degradation rates are shown in the following tables, with DT_{50} values of 3.1, 4.0 and 16.0 days and DT_{90} values of 16.0, 32.0 and 53.1 days measured in „18 Acres", „Gartenaker" and „Marsillargues" soils, respectively.	X5
	5. APPLICANT'S SUMMARY AND CONCLUSION	
5.1 Materials and methods	The rate of aerobic degradation of PP890 was investigated in three soil types in the dark under laboratory conditions at 20°C and moisture contents of pF2 or 40% MWHC. The application rate used was equivalent to 100 g a.s./ha. The GLP study was conducted in 2005 with non-radiolabelled PP890 using a validated LC/MS method.	
5.2 Results and discussion	The level of PP890 present declined to 20.6, 38.7 and 70.3% of applied in „18 Acres", „Gartenaker" and „Marsillargues" soils, respectively after 7 days and further declined to <3.4, <1.8 and <1.0% of applied after 28, 21 and 73 days for the three soils, respectively. Degradation was calculated using non-linear first-order kinetics, with DT_{50} values of 3.1, 4.0 and 16.0 days and DT_{90} values of 16.0, 32.0 and 53.1 days, measured in „18 Acres", „Gartenaker" and „Marsillargues" soils, respectively.	X5 X6
5.3 Conclusion	PP890 was rapidly degraded in soil, with DT_{50} values in the range of 3.1 to 16.0 days and DT_{90} values in the range of 16.0 to 53.1 days at 20°C.	X5
5.3.1 Reliability	1	
5.3.2 Deficiencies	None	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.1/02	**Aerobic degradation in soil, initial study**	
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	Not relevant	
Materials and Methods	[redacted]	
Results and discussion	[redacted]	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.1/02	Aerobic degradation in soil, initial study	
	[redacted]	
Conclusion	[redacted]	
Reliability	[redacted]	
Acceptability	[redacted]	
Remarks	-	

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[redacted]	[redacted]									
[redacted]	[redacted]									
[redacted]	[redacted]									

[redacted]

98/8 Doc IIIA section No.	**7.2.2.1**	**Aerobic degradation in soil, further studies**
91/414 Annex IIA points addressed	**7.1.1.1.1** **7.1.1.2.1**	**Aerobic degradation in soil** **Rate of degradation in soil**

		Official use only
Reference point in dossier	**7.2.2.1/01**	
Title:	PP321 : Laboratory Degradation in Two Standard Soils	
Project/Report number:	RJ0509B	
Author(s):	Tyldesley, D. and Sapiets, A.	
Date of report:	1986	
Published:	No	
Testing facility:	Jealott's Hill Research Station, Bracknell, Berkshire, UK	
Test substance:	*lambda*-Cyhalothrin (PP321), purity not stated.	X1
Study dates	July 1985 to February 1986	
GLP:	Yes	
Reliability indicator	1	

	Official use only
Materials and methods: A series of laboratory tests have been conducted to determine the rate of degradation of *lambda*-Cyhalothrin in a variety of soil types and at application rates ranging from 100-1000 g ai/ha. The characteristics of the soils used are presented in the following tables. Unlabelled *lambda*-Cyhalothrin was separately applied to two standard soils (Speyer 2.2, Speyer 2.3) at the nominal rate of 1 µg/g (dry weight), which corresponds to a field rate of 1000 g/ha. The soils were incubated in the dark, at 20°C and were maintained throughout the study at 40% moisture holding capacity (MHC). Soil samples were taken at intervals up to 225 DAT. **Findings:** *Lambda*-Cyhalothrin degraded steadily in both soils, with calculated half-lives of 185 days (Speyer 2.2) and 115 days (Speyer 2.3).	X2 X3 X4 X5

Characterisation of soils used to determine the rate of degradation of *lambda*-Cyhalothrin

	pH	OM (%)	Clay Content (%)	Soil Type (New Jersey System)
Speyer 2.2	5.6	5.3	8.3	loamy sand
Speyer 2.3	7.1	1.5	10.1	loamy sand

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	Not relevant
Materials and Methods	[redacted]
Results and discussion	[redacted]
Conclusion	[redacted]
Reliability	[redacted]
Acceptability	[redacted]
Remarks	[redacted]

		Official use only
Reference point in dossier	**7.2.2.1/02**	
Title:	Cyhalothrin : Degradation in a Japanese Soil	
Project/Report number:	RJ0491B	
Author(s):	Bharti, H., Bewick, D.W., White, R.D.	
Date of report:	1986	
Published:	No	
Testing facility:	Jealott's Hill Research Station, Bracknell, Berkshire, UK	
Test substance:	^{14}C-cyclopropane Cyhalothrin, radiochemical purity [redacted]	X1
Study dates	May 1983 to August 1984	
GLP:	Yes	
Reliability indicator	1	

	Official use only
Materials and methods: A laboratory study was also carried out in which Cyhalothrin, radiolabelled in the cyclopropane ring, was applied to a Japanese silt loam soil (Nagano), at the nominal rate of 100 g ai/ha. The soil was incubated in a dark enclosed system, at 20°C, in a stream of moist air. The soil was maintained throughout the study at 40% moisture holding capacity (MHC).	X2 X3
Findings: Cyhalothrin degraded with a half-life of approximately 100 days, in the silt loam Japanese soil.	X4 X5 X6

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	Not relevant
Materials and Methods	[redacted]

	[redacted]
Results and discussion	[redacted]
Conclusion	[redacted]
Reliability	[redacted]
Acceptability	[redacted]
Remarks	[redacted]

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.2.1/03	**Aerobic degradation in soil, further studies**	
	6. REFERENCE	
1.1 Reference	Harvey, B.R., Zinner, C.K.J., White, R.D. and Hill, I.R. (1981). Cypermethrin: Degradation in Soil in the Laboratory. Syngenta unpublished report number RJ0162B	
1.2 Data protection	Yes	
1.2.1 Data owner	Syngenta	
1.2.2 Companies with letter of access	None	
1.2.3 Criteria for data protection	[redacted]	
	7. GUIDELINES AND QUALITY ASSURANCE	
2.1 Guideline study	No	
2.2 GLP	Yes.	
2.3 Deviations	A test guideline was not stated, however the methods used were similar to those given in the recommended test guidelines (OECD 304 A, OECD 307, BBA, US EPA). Calculation of soil degradation rates was made using a visual estimate only and are not considered valid. The Fen peat soil used in the study contained an organic matter content of 72.7% and is not considered representative of soil in the intended areas of use.	
	8. MATERIALS AND METHODS	
3.1 Test material (radiolabelled)	cis - [benzyl ring-UL-^{14}C] cypermethrin trans - [benzyl ring-UL-^{14}C] cypermethrin	X1
3.1.1 Lot/Batch number	[redacted]	
3.1.2 Specification	Specific activity 0.127 mCi/mg (both isomers)	
3.1.3 Purity	RCP (radiochemical purity) [redacted] by TLC	
3.1.4 Further relevant properties	The cis and trans isomers were mixed in the ratio 55:45 cis:trans prior to starting the test.	
3.2 Test material (non radiolabelled)	Non-radiolabelled cypermethrin	
3.2.1 Lot/Batch number	[redacted]	
3.2.2 Specification	Not stated	
3.2.3 Purity	Not stated	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.2.1/03	**Aerobic degradation in soil, further studies**	
3.2.4 Further relevant properties	The cis and trans isomers were mixed in the ratio 55:45 cis:trans prior to starting the test.	
3.3 Reference Materials (non radiolabelled)	Compound III 3-phenoxybenzaldehyde Compound IV 3-phenoxybenzoic acid Compound V 3-phenoxybenzyl alcohol Compound IX (RS)-α-cyano-4′-hydroxy-3-phenoxybenzyl, cis, trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylate	X2
3.3.1 Lot/Batch number	Not stated	
3.3.2 Purity	Not stated	
3.4 Test performance	The route and rate of aerobic degradation of cypermethrin was investigated in three soil types (a clay loam, a loamy course sand and a Fen peat) in the dark under laboratory conditions at a range of temperatures (15, 25 or 35°C) and a moisture content of 40% or 48% water holding capacity. Incubation under sterile conditions was also investigated. Cypermethrin and *lambda*-cyhalothrin are pyrethroid insecticides that both contain the same 3-phenoxybenzyl moiety. The results obtained from this study conducted using ^{14}C-benzyl ring labeled cypermethrin will be indicative of the results that would be obtained using the same radiolabel position in *lambda* cyhalothrin.	
3.4.1 Test soils	A summary of the characterisation information for the soils used is provided in the following tables. The Fen peat soil used contained an organic matter content of 72.7% and is not considered representative of soils in the intended areas of use. The results from this soil are included for completeness only.	X3
3.4.2 Treatment to soil samples	Non-sterile soil samples were treated with radiolabelled cypermethrin as follows: Clay loam Aerobic – 25°C at 0.2 kg a.s./ha Aerobic – 15°C at 0.2 kg a.s./ha Aerobic – 35°C at 0.2 kg a.s./ha Aerobic – 25°C at 2.0 kg a.s./ha Loamy course sand and Fen peat Aerobic – 25°C at 0.2 kg a.s./ha Soil samples sterilised by gamma irradiation were treated with radiolabelled cypermethrin as follows: Clay loam and Loamy course sand Aerobic – 25°C at 0.2 kg a.s./ha Radiolabelled cypermethrin (25 µg or 250 µg) was applied to each soil sample drop-wise in acetone solution (100 µL). Following treatment, distilled water (490 µL) was added to aid dispersion of the test compound within the soil.	X4

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IIIA 7.2.2.1/03	**Aerobic degradation in soil, further studies**	
3.4.3 Incubation of soil samples	Sieved soil (2 mm mesh) was adjusted to either 40% moisture holding capacity (clay loam and loamy course sand soils) or 48% moisture capacity (Fen peat soil) and dispensed into individual glass pots (4 cm diameter x 3 cm high). After treatment the pots were placed into glass columns supported on PTFE coated wire racks. Moist carbon dioxide free air was drawn through the columns and the effluent air passed through traps containing either 0.05M sulphuric acid, 2-methoxyethanol or ethanolamine (x2) to collect volatile degradation products. Sterile incubation vessels were protected by 0.2 µm in-line filters to maintain sterility. Radioactivity collected in the volatile traps was determined by liquid scintillation counting (LSC). Traps containing 2M sodium hydroxide were attached to two incubation vessels to collect evolved carbon dioxide the presence of which was confirmed by precipitation of insoluble barium carbonate with barium chloride solution. Soil samples were taken for analysis at intervals of 0 (2 hours), 1, 3, 10 and 25 weeks. Soil samples were extracted by refluxing (18 hour) in hexane:acetone (3:2). Soils sampled at 10 and 25 weeks were further extracted by refluxing in methanol (18 hours) and water (6 hours). Soil extracts were analysed for radioactivity by LSC. Hexane:acetone and methanol extracts containing >5% of the applied radioactivity (AR) only were concentrated and analysed for cypermethrin and degradation products by thin layer chromatography (TLC). The extracted soil residues were air dried and the radioactivity present determined by combustion/LSC.	X5 X6
3.4.4 Chromatographic analysis	Soil extracts were analysed by TLC using silica gel plates developed in toluene:diethyl ether:acetic acid (75:25:1) or hexane:diethyl ether (10:1). Non radiolabelled reference standards were visualised using UV light (254 nm). Radioactive regions were detected using autogradiography and quantified by removing the appropriate area from the TLC plate and subjecting the silica to combustion/LSC analysis.	
3.5 Degradation kinetics	Not determined. Degradation rates were only estimated visually and are therefore not considered sufficiently accurate and have not been summarised.	
	9. RESULTS	
4.1 Recovery and distribution	The recovery of radioactivity from soils was typically greater than 90% at each sampling interval indicating a complete recovery of applied radioactivity. Low recoveries (<90% AR) were observed in selected soils especially at the final sampling interval (25 weeks). The low recoveries are likely to be due to a gradual loss of volatile radioactivity (carbon dioxide) during the long incubation time.	X7
4.2 Profile of components	The profile of extracted components from soils incubated under non-sterile conditions at 15, 25 and 35°C after treatment with	

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	cypermethrin is summarised in the following tables. Cypermethrin was readily degraded in non-sterile soil at 25°C. Carbon dioxide and unextracted residues were the most prominent degradation products, accounting for up to 69.3% of the recovered radioactivity after 25 weeks and 33.4% of the recovered radioactivity after 3 weeks respectively. The levels of unextracted radioactivity in the clay loam and loamy course sand soils were declining at the end of the incubation period indicating continued metabolism. Levels of the cypermethrin related degradation products 3-phenoxybenzaldehyde, 3-phenoxybenzoic acid and (RS)-α-cyano-4′-hydroxy-3-phenoxybenzyl, cis, trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylate were generally low, with maximum levels of 6.4, 12.3 and 7.8, respectively observed in the first week of incubation at 25°C. The route of degradation of cypermethrin was not affected following incubation at 15 and 35°C and was not affected by increasing the treatment rate by a factor of ten. Under each of these conditions, carbon dioxide and unextracted residues were still the predominant degradation products formed, with 3-phenoxybenzaldehyde, 3-phenoxybenzoic acid and (RS)-α-cyano-4′-hydroxy-3-phenoxybenzyl, cis, trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylate present at low levels. Under sterile incubation conditions the degradation of cypermethrin was significantly reduced, with the hydrolysis product 3-phenoxybenzoic acid the only degradation product formed in substantial amounts (up to 40.5% of the recovered radioactivity after 10 weeks).	X8
4.3 Route of degradation	The major degradation pathway of cypermethrin in soil is via ester hydrolysis, initially forming 3-phenoxybenzaldehyde which is then further degraded to 3-phenoxybenzoic acid by oxidation. These metabolites were observed in this study due to the phenyl ring position of the radiolabel. Ring hydroxylation of cypermethrin to form (RS)-α-cyano-4′-hydroxy-3-phenoxybenzyl, cis, trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylate was seen as a minor route of degradation. Complete degradation of the phenyl ring structure to carbon dioxide, the principal metabolite, was observed as a result of microbial action.	
4.4 Rate of degradation	Not determined. Degradation rates were only estimated visually in the report.	
	10. APPLICANT'S SUMMARY AND CONCLUSION	
5.1 Materials and methods	The route and rate of aerobic degradation of cypermethrin was investigated in three soil types in the dark under laboratory conditions at temperatures of 15, 25 and 35°C and moisture contents of 40 or 48% water holding capacity. The study was conducted using an application rate equivalent to 0.2 g a.s./ha. An application rate of 2.0 g a.s./ha and the effect of using sterile soil were also investigated in selected soils. The GLP study was	

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IIIA 7.2.2.1/03	**Aerobic degradation in soil, further studies**	
	in 1981.	
5.2 Results and discussion	The recovery of radioactivity from soils was typically greater than 90% at each sampling interval. Low recoveries (<90% AR) were observed in selected soils at later sampling intervals (10 and 25 weeks) but as the evolution of carbon dioxide was considerable these losses were likely to be the result of incomplete collection of this product over the long incubation time. Overall the mass balance was considered acceptable. Cypermethrin was readily degraded in non-sterile soil at each of the temperature studied. The route of degradation was not affected by temperature or by the application rate tested. Carbon dioxide and unextracted soil residues were the most prominent degradation products detected, accounting for up to 69.3% of the recovered radioactivity after 25 weeks and 33.4% of the recovered radioactivity after 3 weeks respectively at 25°C. The cypermethrin related degradation products 3-phenoxybenzaldehyde, 3-phenoxybenzoic acid and (RS)-α-cyano-4′-hydroxy-3-phenoxybenzyl, cis, trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylate were detected, but at levels not exceeding 10% of the recovered radioactivity in representative soils at 25°C. Degradation of cypermethrin in soil proceeded via ester hydrolysis to form 3-phenoxybenzaldehyde and then 3-phenoxybenzoic acid by oxidation. Ring hydroxylation of cypermethrin to form (RS)-α-cyano-4′-hydroxy-3-phenoxybenzyl, cis, trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylate was a minor route of degradation. Mineralisation of the radiolabelled phenyl ring via microbial degradation was the principal product formed in the study.	
5.3 Conclusion	Cypermethrin is readily degraded in soil, principally to carbon dioxide. The cypermethrin related metabolites , 3-phenoxybenzoic acid and (RS)-α-cyano-4′-hydroxy-3-phenoxybenzyl, cis, trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylate were observed as intermediate degradation products not exceeding 10% of the recovered radioactivity in representative soils. Unextracted soil residues were not accumulating at the end of the study. Cypermethrin and *lambda*-cyhalothrin are pyrethroid insecticides that both contain the same 3-phenoxybenzyl moiety. The results obtained from this study conducted using ^{14}C-benzyl ring labeled cypermethrin will be indicative of the results that would be obtained using the same radiolabel position in *lambda* cyhalothrin.	X9
5.3.1 Reliability	1	
5.3.2 Deficiencies	Degradation rates were only estimated visually and are therefore not sufficiently accurate and have not been summarised. The results obtained from the Fen peat soil (organic matter content 72.7%) are not considered representative of soils likely to be exposed in the intended areas of use. The results obtained from	

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IIIA 7.2.2.1/03	**Aerobic degradation in soil, further studies**	
	this soil type are included for completeness only.	
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	Not relevant	
Materials and Methods	[redacted]	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.2.1/03	Aerobic degradation in soil, further studies	
	[redacted]	
Results and discussion	[redacted]	
Conclusion	[redacted]	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.2.1/03	Aerobic degradation in soil, further studies	
Reliability	[redacted]	
Acceptability	[redacted]	
Remarks	-	

[redacted]

[redacted]

98/8 Doc IIIA section No.	**7.2.2.2**	**Field soil dissipation and accumulation**
91/414 Annex IIA point addressed	**7.1.1.2.2**	**Rate of degradation – field studies**

		Official use only
Reference point in dossier	**7.2.2.2/01**	
Title:	*Lambda*-Cyhalothrin : Soil Dissipation Studies (West Germany 1989)	
Project/Report number:	RJ0879B	
Author(s):	Burke, S. and Sapiets, A.	
Date of report:	1990	
Published:	No	
Testing facility:	Jealott's Hill Research Station, Bracknell, Berkshire, UK	
Test substance:	*lambda*-Cyhalothrin (5% EC formulation)	X1
Study dates	April 1989 to April 1990	
GLP:	Yes	
Reliability indicator	1	

	Official use only
Materials and methods: *Lambda*-Cyhalothrin, formulated as a 5% EC formulation, was applied to the bare soil at a rate of 125 g ai/ha, at four sites in Western Germany. The characteristics of the soil used are presented below:	X2 X3 X4
Findings: *Lambda*-Cyhalothrin degraded rapidly at all locations. The calculated DT_{50} values were 6, 26, 28 and 40 days at the Varendorf, Mechtersheim, Inzkofen and Gachenbach trial sites, respectively. The corresponding DT_{90} values were 68, 85, 92 and 207 days, respectively. No detectable residues were found below 10 cm, at any sampling interval, indicating that there is no potential for measurable residues to leach to ground water.	X5

Soil	pH	OM (%)	Clay Content (%)	Soil Texture
Varendorf	5.7	1.6	10	sandy loam
Mechtersheim	7.5	0.6	33	silty clay loam
Inzkofen	7.2	2.1	24	silt loam
Gachenbach-Etzlberg	7.0	2.4	13	sandy loam

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	Not relevant
Materials and Methods	[redacted]

	[redacted]
Results and discussion	[redacted]

Conclusion	[redacted]
Reliability	[redacted]
Acceptability	[redacted]
Remarks	[redacted]

		Official use only
Reference point in dossier	**7.2.2.2/02**	
Title:	PP321: Fate of Radiolabelled Material in Soil Under Field Conditions	
Project/Report number:	RJ0529B	
Author(s):	Bewick, D.W., Bartlett, D.W., Hendley, P.	
Date of report:	1986	
Published:	No	
Testing facility:	Jealott's Hill Research Station, Bracknell, Berkshire, UK	
Test substance:	^{14}C-cyclopropane and ^{14}C-phenyl *lambda*-Cyhalothrin (PP321), radiochemical purity [redacted] (both labels).	X1
Study dates	June 1985 to September 1986	
GLP:	Yes	
Reliability indicator	1	

	Official use only
Materials and methods: *Lambda*-Cyhalothrin, separately radiolabelled in the cyclopropane and phenyl rings, was applied to bare soil, at sites in Mississippi and Illinois, in the USA. The soils (0-10 cm horizon) were characterised as silt and a silty clay loam, respectively. The radiolabelled *lambda*-Cyhalothrin was applied as a 5% EC formulation (GFU383C), in water, at a rate of 125 g ai/ha.	X2 X3 X4 X5
Findings: The degradation of *lambda*-Cyhalothrin was rapid, and as expected from the laboratory studies, the metabolism was extensive. The half-lives for degradation were between 12 and 33 days for the Mississippi site and Illinois sites, respectively. Leaching did not contribute to the dissipation, with almost the entire recovered radioactivity in the top 10 cm, throughout the study. Radioactive residues in the 10-20 cm horizon were generally undetectable and always below 0.001 mg/kg. No detectable radioactive residues were ever present in the 20-30 cm horizon.	X6 X7
The four major degradation products were characterised and quantified. ^{14}C-cyclopropyl-labelled material was used to track the development and subsequent decline of both the hydroxylated parent material (Compound XV) and the hydrolysis product (Compound Ia). ^{14}C-phenyl-labelled material was used to track the build up and decline of the other hydrolysis product 3-phenoxybenzoic acid (Compound V) and its corresponding hydroxylated product 3-(4'-hydroxyphenoxy)benzoic acid (Compound VII).	
The metabolites of *lambda*-Cyhalothrin were monitored throughout the study, and were only detected in small amounts. The major metabolites found were Compound Ia, which represented a maximum of only 5.5% at the Mississippi trial after 14 days and Compound XV, which represented only 3.9% at the Illinois trial, again after 14 days. Generally, levels of these metabolites were seen to decline as the study progressed, with only 0.2% and 2.4% of	

the respective metabolites remaining after 300 days. The maximum amounts of the individual metabolites determined in these trials are shown in the following table.	X8

Maximum Amounts of ^{14}C-*Lambda*-Cyhalothrin Degradation Products Detected in Soil Dissipation Studies Conducted in Mississippi and Illinois, During 1985.

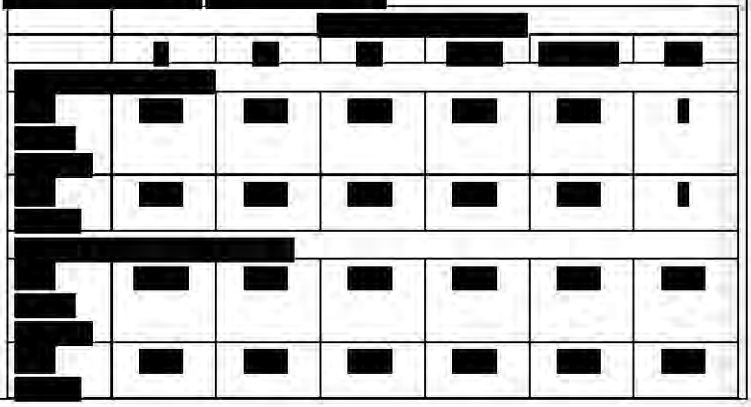
Trial Site	Vicksburg - Mississippi			Champaign - Illinois		
Compound No.	% Applied Radioactivity	Soil Residue mg/kg	DAT	% Applied Radioactivity	Soil Residue mg/kg	DAT
Ia	5.5	0.007	14	3.3	0.005	28
V	0.7	<0.001	14	2.5	0.004	28
VII	0.5	<0.001	14	1.0	0.002	124
XV	2.0	0.005	14	3.9	0.012	14

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	Not relevant
Materials and Methods	[redacted]

[redacted]

Results and discussion

[redacted]



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Conclusion	[redacted]

	[redacted]
Reliability	[redacted]
Acceptability	[redacted]
Remarks	[redacted]

98/8 Doc IIIA section No.	7.2.2.3	Extent and nature of bound residues

	JUSTIFICATION FOR NON-SUBMISSION OF DATA	Official use only
Other existing data [X] Limited exposure [ ]	Technically not feasible [ ] Scientifically unjustified [ ] Other justification [ ]	
Detailed justification:	[redacted]	
Undertaking of intended data submission [ ]		
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	Not relevant	
Evaluation of applicant's justification	[redacted]	
Conclusion	[redacted]	
Remarks		

98/8 Doc IIIA section No.	**7.2.2.4**	**Other soil degradation studies**
91/414 Annex IIA point addressed	**7.1.1.1.2**	**Supplementary soil degradation studies - soil photolysis**

		Official use only
Reference point in dossier	**7.2.2.4/01**	
Title:	PP321: Photodegradation on a Soil Surface	
Project/Report number:	RJ0537B	
Author(s):	Parker, S. and Leahey, J.P.	
Date of report:	1986	
Published:	No	
Testing facility:	Jealott's Hill Research Station, Bracknell, Berkshire, UK	
Test substance:	^{14}C-cyclopropane and ^{14}C-phenyl *lambda*-Cyhalothrin, radiochemical purity, [redacted] respectively.	X1
Study dates	July 1986 to October 1986	
GLP:	Yes	
Reliability indicator	1	

	Official use only
Materials and methods: The ^{14}C-*lambda*-Cyhalothrin was applied to the surface of a thin layer of sandy loam soil ("18 Acres") spread over small stainless steel plates at a rate equivalent to 40 g/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 30° in summer. The irradiated plates were taken for analysis at intervals equivalent to 6, 14, 26 and 34 days of sunlight, for the cyclopropane labelled treatment, and at intervals equivalent to 7, 16, 24 and 35 days for the phenyl-labelled treatment. Throughout the irradiation the plates were maintained at a temperature of approximately 25°C. The plates were also 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 intervals is summarised in the following tables. **Findings:** These results demonstrate that photodegradation of *lambda*-Cyhalothrin is not an important process on a soil surface. Slow degradation does occur, but the major degradation product formed, Compound II, is also formed under dark conditions. Thus chemical hydrolysis of the cyanide group to an amide, and not photoinitiated hydrolysis, is the major degradation pathway. This hydrolysis is faster in the dark control samples because these samples retain higher levels of water (3%) than the irradiated samples, which will have been dried out by the lamp.	X2 X3 X4 X5 X6, X7

Cyclopropane label

Residue	34 Days Irradiation	30 Days Dark Control
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%

Phenyl label

Residue	35 Days Irradiation	30 Days Dark Control
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

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	Not relevant
Materials and Methods	[redacted]
Results and discussion	[redacted]

	[redacted]
Conclusion	[redacted]
Reliability	[redacted]
Acceptability	[redacted]
Remarks	[redacted]

98/8 Doc IIIA section No.	**7.2.3.1**	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**
91/414 Annex IIA point addressed	**7.1.2**	**Adsorption and desorption**

		Official use only
Reference point in dossier	**7.2.3.1/01**	
Title:	PP321: Adsorption and desorption in soil	
Project/Report number:	RJ0535B	
Author(s):	Vickers, J.A. and Bewick, D.W.	
Date of report:	1986	
Published:	No	
Testing facility:	Jealott's Hill Research Station, Bracknell, Berkshire, UK	
Test substance:	^{14}C-phenyl *lambda*-Cyhalothrin, radiochemical purity [redacted]	X1
Study dates	July 1986 to September 1986	
GLP:	Yes	
Reliability indicator	1	

	Official use only
Materials and methods:	
A preliminary experiment was carried out to determine the time and soil:solution ratio that ensured adsorption equilibrium was achieved and measured accurately. Adsorption was by dosing pre-equilibrated soil and 0.01M $CaCl_2$ in glass tubes with ^{14}C-*lambda*-Cyhalothrin and shaking. The preliminary experiment was then followed by a full adsorption/desorption experiment which was carried out, on four soils, using doses of 0.02, 0.05, 0.10 and 0.20 mg ^{14}C-*lambda*-Cyhalothrin/L. The *lambda*-Cyhalothrin was applied to pre-equilibrated soil slurries with 1:100 soil:solution ratio and then shaken for 18 hours to achieve equilibration.	X2 X3 X4 X5 X6 X7
Findings:	
The preliminary experiment showed that less than 1% of the compound was degraded in the test system. Most of the degradation products were in the aqueous phase and would therefore result in an underestimate of adsorption of *lambda*-Cyhalothrin. Stability checks in the full experiment gave similar results to the preliminary experiment. Mean adsorption coefficients from the adsorption step on whole soil (Kd) were between 1140 and 3850. The resulting Koc values were between 55926 and 520270. The Koc values classify the compound as immobile on the McCall scale of pesticide mobility in soil. Standard adsorption partition coefficients (Kd values) increased on each successive desorption step and were all larger than on the adsorption step, demonstrating that adsorption was not entirely reversible. The extremely strong adsorption to soil demonstrated by *lambda*-Cyhalothrin indicates that the compound will have no potential to leach to ground water.	X8 X9

Location	pH	CEC	OC %	Clay %	Soil Type	Mean Kd	Koc[1]
18 Acres	6.3	16.0	2.7	25	sandy clay loam	1510 – 2170	55926 to 80370
Frensham	6.2	6.4	1.2	8	sandy loam	1140 – 1410	95000 to 117500
Vicksburg	6.0	6.8	0.74	10	silt	1910 – 3850	258108 to 520270
Goldsboro	6.6	8.5	1.6	10	sandy loam	1370 - 2800	85625 to 175000

CEC = Cation exchange capacity (meq/100 g)
OC = Organic carbon.
[1] Values calculated from the range of Kd data shown.

McCall Scale of Pesticide Mobility in Soil

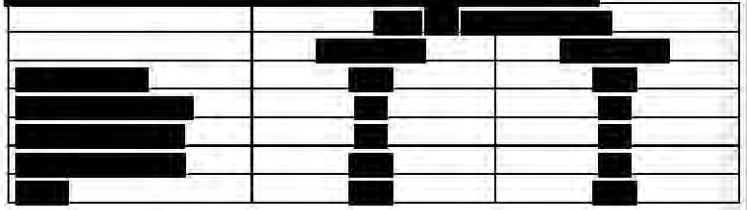
Low Limit For Koc	High Limit For Koc	Mobility Class
	>5000	Immobile
2000	<5000	Slight
500	<2000	Low
150	<500	Medium
50	<150	High
0	<50	Very High

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	Not relevant
Materials and Methods	[redacted]

[redacted]

Results and discussion

[redacted]



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	[redacted]
Conclusion	[redacted]
Reliability	[redacted]

	[redacted]
Acceptability	[redacted]
Remarks	[redacted]

		Official use only
Reference point in dossier	**7.2.3.1/02**	
Title:	*Lambda*-Cyhalothrin: Adsorption and Desorption in Soil and Sediment	
Project/Report number:	RJ1913B	
Author(s):	Muller, K., Goggin, U. and Lane, M.C.G	
Date of report:	1996	
Published:	No	
Testing facility:	Jealott's Hill Research Station, Bracknell, Berkshire, UK	
Test substance:	^{14}C-cyclopropane *lambda*-Cyhalothrin, radiochemical purity [redacted]	X1
Study dates	September 1994 to June 1995	
GLP:	Yes	
Reliability indicator	1	

	Official use only
Material and methods: The adsorption and desorption of ^{14}C-*lambda*-Cyhalothrin were studied in 5 soils and 5 sediments. The physico-chemical properties of the soils and sediments are summarised in the following tables.	X2
^{14}C-*lambda*-Cyhalothrin was added to prepared slurries to give initial concentrations of 0.019, 0.038, 0.076, 0.152 and 0.306 µg/mL in the aqueous phase. The soil/aqueous ratio was 0.5 g soil to 30 mL aqueous.	X3 X4 X5 X6
Findings: *Lambda*-Cyhalothrin was very strongly adsorbed to all the soils and sediments studied. The mean values for the adsorption step (Kd, K_{OC} and K_F) are summarised in the following tables.	X7 X8 X9
Average K_{OC} values after the desorption step were similar to those resulting from the adsorption step, ranging from 99900 to 954000. However, in the majority of cases the desorption coefficients were higher than the corresponding adsorption coefficients, suggesting that adsorption of *lambda*-Cyhalothrin is not entirely reversible.	X10
Lambda-Cyhalothrin has a mean K_{OC} of 333000 in the soils/sediments studied. Using the McCall Classification scale (*McCall P J, Laskowski D A, Swann R L and Dishburger H J, 1980*), these results indicate that *lambda*-Cyhalothrin is immobile in soil.	

Physico-chemical properties of soils

Soil Property	Hyde Farm	East Anglia	Wisborough Green	ERTC	NRTC
% Sand	64	87	10	78	12
% Silt	20	5	60	16	52
% Clay	16	8	30	6	36
% Organic matter	1.9	1.7	3.4	0.5	3.7
% Organic carbon[1]	1.1	1.0	2.0	0.3	2.1
pH	6.5	8.0	6.0	6.8	6.2
Cation exchange capacity (meq/100g)	11	4.9	15	2.6	28
% Moisture holding capacity (1/3 Bar)	15	8.6	30	6.1	23
% Moisture holding capacity (15 Bar)	8.4	5.1	20	2.4	13
Soil classification	Sandy loam	Loamy sand	Silty clay loam	Loamy sand	Silty clay loam

[1] Calculated as organic matter content ÷ 1.724.

Physico-chemical Properties of Sediments

Soil Property	Virginia Waters	"Mesocosm"	Millstream Pond	Iron Hatch	Old Basing
% Sand	79	53	88	94	74
% Silt	9	18	5	3	11
% Clay	12	29	7	3	15
% Organic matter	4.4	4.3	1.7	0.8	7.6
% Organic carbon[1]	2.6	2.5	1.0	0.5	4.4
pH	6.6	7.9	8.3	8.3	7.8
Cation exchange capacity (meq/100g)	16	21	5.7	2.6	14
% Moisture holding capacity (1/3 Bar)	14	29	9.5	3.6	22
% Moisture holding capacity (15 Bar)	9.2	18	5.3	2.2	14
Soil classification	Sandy loam	Sandy loam	Loamy sand	Sand	Sandy loam

[1] Calculated as organic matter content ÷ 1.724.

***Lambda*-Cyhalothrin adsorption coefficients**

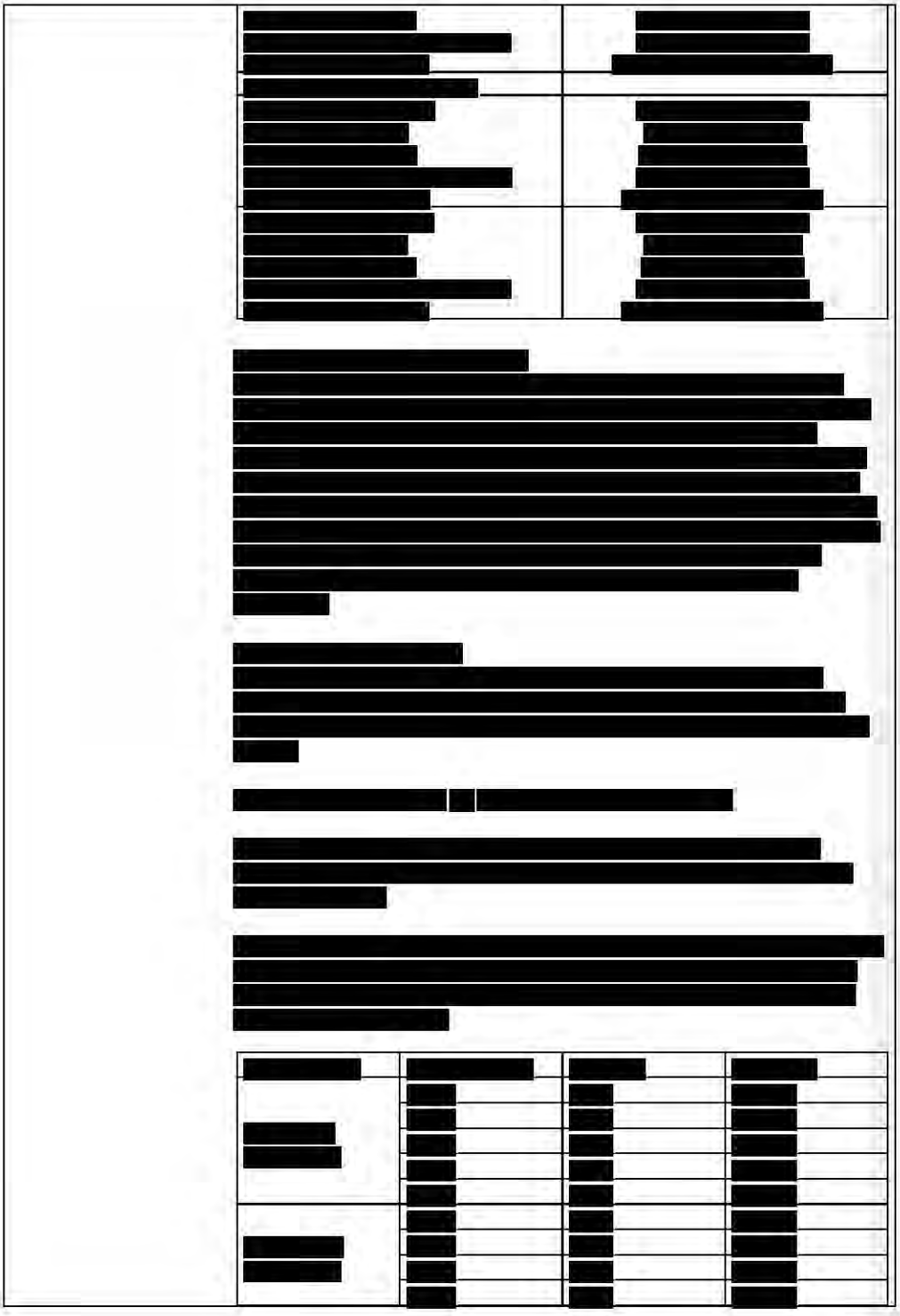
Soil/Sediment	Kd	K_{OC}	K_F
Hyde Farm	3810	346000	1780
East Anglia	1970	200000	2080
Wisborough Green	5880	298000	5440
ERTC	2100	724000	1960
NRTC	4490	209000	2360
Virginia Waters	6890	270000	1500
"Mesocosm"	7610	305000	33000
Millstream Pond	3470	352000	2560
Iron Hatch	2400	518000	2520
Old Basing	4870	110000	1660

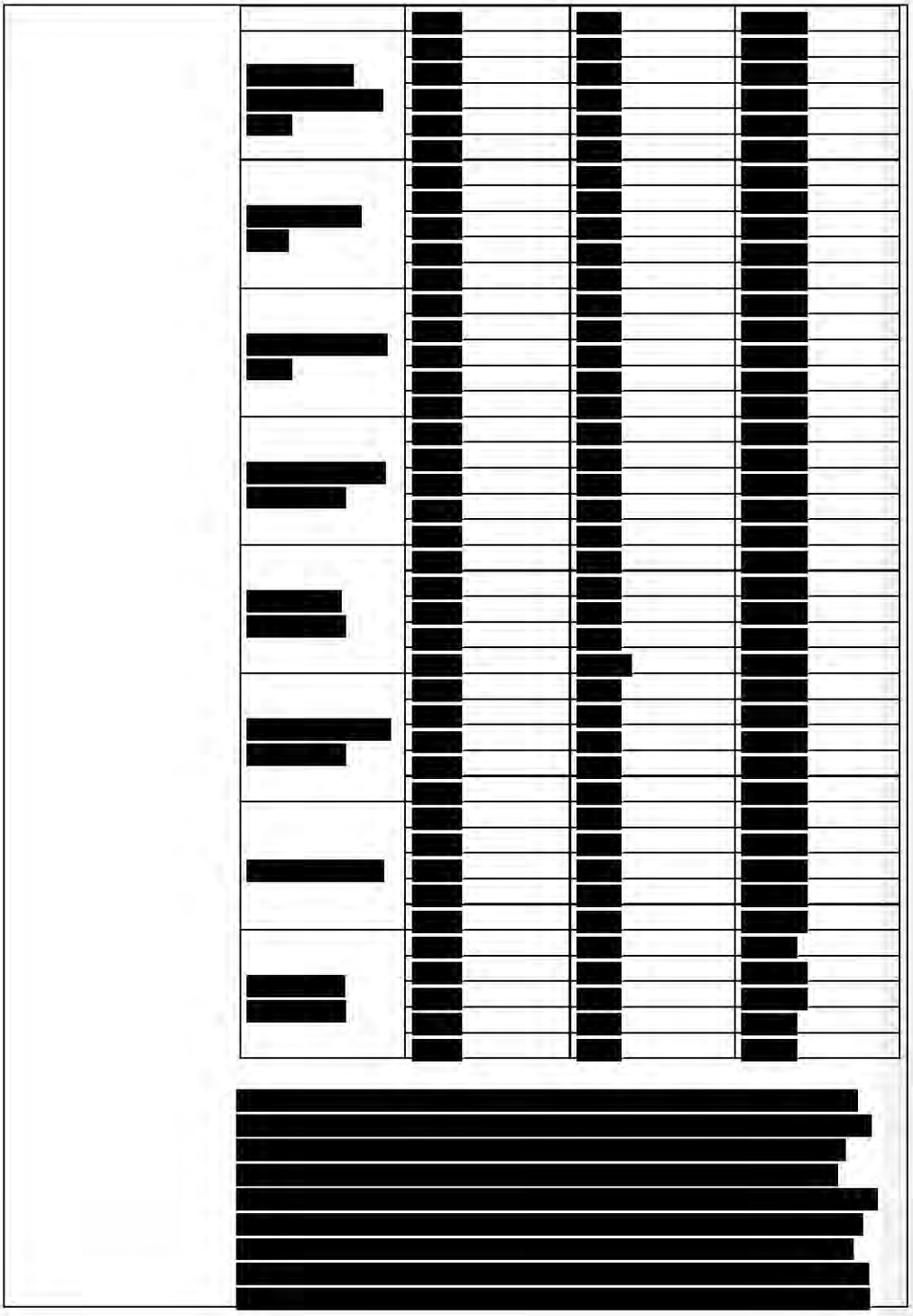
	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	Not relevant
Materials and Methods	[redacted]

[redacted]

Results and discussion

[redacted]





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[redacted]		

[redacted]

Conclusion

[redacted]

	[redacted]
Reliability	[redacted]
Acceptability	[redacted]
Remarks	[redacted]

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/03	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
	1 REFERENCE	
1.1 Reference	Feeney, E. and Lane, M.C.G. (1998). Lambda-Cyhalothrin: Adsorption and Desorption Properties of Compound XV (R211133), a Soil Degradate, in Six Soils. Syngenta unpublished report number RJ2622B	
1.2 Data protection	Yes	
1.2.1 Data owner	Syngenta	
1.2.2 Companies with letter of access	[redacted]	
1.2.3 Criteria for data protection	[redacted]	
	2 GUIDELINES AND QUALITY ASSURANCE	
2.1 Guideline study	Yes. Study was conducted according to OECD 106 guidelines.	
2.2 GLP	Yes.	
2.3 Deviations	None.	
	3 MATERIALS AND METHODS	
3.1 Test material (radiolabelled)	^{14}C-cyclopropane labeled R211133. The test compound was a 1:1 mixture of (1R) *cis* α-(S) and of (1S) *cis* α-(R) α-cyano-3-(4-hydroxyphenoxy)benzyl-3-(Z-2-chloro-3,3,3-trifluoro prop-1-enyl)-2,2-dimethylcyclopropanecarboxylate	
3.1.1 Lot/Batch number	[redacted]	
3.1.2 Specification	Specific activity 2.2 GBq mmol^{-1}	
3.1.3 Purity	RCP (radiochemical purity) [redacted] by TLC	
3.1.4 Further relevant properties	None specified.	X1
3.2 Test material (non radiolabelled)	Non-radiolabelled R211133	
3.2.1 Lot/Batch number	[redacted]	
3.2.2 Specification	Not stated	
3.2.3 Purity	[redacted]	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/03	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
3.2.4 Further relevant properties	None specified.	
3.3 Reference Materials (non radiolabelled)	None specified.	
3.3.1 Lot/Batch number	Not applicable	
3.3.2 Purity	Not applicable	
3.4 Soil types	The characterisation data for the soils is summarised in the following tables.	
3.5 Testing procedure	The sorption properties of the *lambda*-cyhalothrin soil metabolite R211133 were investigated in six soils (UK and US origin) using the batch equilibrium technique.	
3.5.1 Test system	Tests were conducted in glass centrifuge tubes.	
3.5.2 Test solution and Test conditions	The test was conducted using calcium chloride solution (0.01M) sterilised by autoclaving prior to use.	
3.6 Test performance	--	
3.6.1 Preliminary test	Soil slurries were prepared using "18 Acres" sandy loam soil (1.0 g) and 0.01 M calcium chloride solution (19.9 mL) containing 0.2 µg/mL of R211133. The slurries were shaken for 2 and 4 hour periods at 20°C. The equilibrium time was established and the stability of R211133 was assessed by thin layer chromatography (TLC). The preliminary test was conducted to establish suitable conditions for the definitive Freundlich sorption test.	
3.6.2 Screening test: Adsorption	Not performed.	
3.6.3 Screening test: Desorption	Not performed.	
3.6.4 Definitive study, Freundlich sorption isotherms	The study was conducted by preparing soil slurries containing 0.5 g soil and 19.9 mL 0.01M calcium chloride solution (a soil to solution ratio of 1:40 w/v). The slurries were pre-equilibrated overnight prior to addition of the test material. Radiolabelled R211133 was added to the slurries dissolved in acetonitrile to produce concentrations of 0.02, 0.04, 0.08, 0.16 and 0.32 µg/L. Duplicate soil slurries were prepared for each soil at each concentration. Equilibration was performed by shaking the treated soil slurries on a mechanical shaker for 2 hours at 20°C. After equilibration, the soil and aqueous layers were separated by centrifugation and the radioactivity in the aqueous layer quantified by LSC. A single desorption step was performed by removing the entire aqueous layer and replenishing it with an equal amount of fresh	X2 X3 X4

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/03	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
	sterile 0.01M calcium chloride solution. The resulting soil slurries were shaken for a further 2 hour period prior to centrifugation and quantification as previously described. The stability of R211133 during the test was determined by analysing adsorption supernatant and soil residue samples. The adsorption supernatant samples were partitioned with dichloromethane and the soil samples extracted with acetonitrile, with the resulting organic fractions analysed for R211133 content by TLC.	X5
3.6.5 Chromatographic analysis	TLC analysis used silica gel plates developed with either; methyl chloroform: acetonitrile (80:20 v/v), hexane: TBME (60:30 v/v) or dichloromethane: acetonitrile: formic acid (75:25:2 v/v/v). The identity of R211133 was confirmed using co-chromatography with an authentic reference standard which was visualised under short wave UV light. Radioactivity was detected using a Fuji BAS2000 imaging system.	
	4 RESULTS	
4.1 Preliminary test	The preliminary test showed that R211133 was very strongly adsorbed to soil and that a soil:solution ratio of 1:40 w/v was appropriate for the definitive test. A short 2 hour equilibration time was necessary to minimise degradation of R211133 during the experiment. The potential for adsorption to test vessels was also assessed and concluded that glass tubes in the presence of soil would result in acceptable losses (*ca* 6% of applied radioactivity).	X6 X7
4.2 Screening test: Adsorption	Not performed. Information concerning equilibrium time, soil:solution ratio and stability was obtained from the preliminary test.	X8
4.3 Screening test: Desorption	Not performed. The equilibration period for the desorption phase was set at 2 hours, the same as that used for the adsorption phase.	
4.4 Definitive study, Freundlich sorption isotherms	Freundlich adsorption isotherms were determined for all soils six over a concentration range of 0.02 to 0.32 µg/L (5 concentrations) using a soil to solution ratio of 1:40 w/v and a temperature of 20°C. The resulting adsorption and desorption partition and Freundlich coefficients for each soil are summarised in the following tables.	X9
4.4.1 Adsorption parameters	The range of soil partition coefficients for the adsorption phases in the six soils over the concentrations used was 700 to 2000 mL/g. The mean Freundlich soil adsorption coefficients, K"were in the range 900 to 2000 mL/g in the six soils and the Freundlich exponents (1/n) for adsorption were 0.97 to 1.08. Mean Freundlich soil adsorption coefficients normalised for organic carbon content, K"oc were in the range 60000 to 110000 mL/g for the six soils, indicating R211133 as ‚immobile"	X10 X11

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/03	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
	according to the McCall classification scale quoted in the report.	
4.4.2 Desorption parameters	The soil desorption partition coefficients in the six soils were in the range 800 to 3000 mL/g. The mean Freundlich soil desorption coefficients, K"were in the range 900 to 2800 mL/g in the six soils and the corresponding Freundlich exponents (1/n) for desorption were 0.92 to 1.07. The desorption coefficients were slightly higher than the corresponding adsorption coefficients, indicating that the process of R211133 adsorbing to soil is not entirely reversible.	
4.4.3 Recovery over duration of study	The amount of radioactivity recovered following the desorption phase of the test was in the range 89 to 103%, with an overall mean of 95%, indicating a complete recovery of the applied material.	
4.4.4 Stability over duration of study	Using samples from the higher test concentrations, 90% of the recovered radioactivity in the aqueous phase was identified as R211133. In the soil samples, a mean level of 68% was recovered. The apparent low recovery of R211133 was attributed in part to instability on the TLC plates during chromatographic analysis, although it was recognised that R211133 was not entirely stable during the equilibrium and extraction process. Overall it was concluded that the adsorption coefficients may be overestimated to a small extent as a result of the low recovery of R211133.	X12
4.5 Degradation product(s)	Degradation products were not identified in the study.	
	5 APPLICANT'S SUMMARY AND CONCLUSION	
5.1 Materials and methods	The sorption properties of R211133 were investigated in six soils (of UK and US origin) using the batch equilibrium technique. The GLP study was conducted to OECD 106 Guidelines in 1998.	
5.2 Results and discussion	The total recovery of the applied radioactivity was in the range of 89 to 103%, indicating that no significant loss of radioactivity from the test system occurred during the test. The range of soil partition coefficients for the adsorption phases in the six soils over the concentrations used was 700 to 2000 mL/g. The mean Freundlich soil adsorption coefficients, K"were in the range 900 to 2000 mL/g in the six soils and the Freundlich exponents (1/n) for adsorption were 0.97 to 1.08. Mean Freundlich soil adsorption coefficients normalised for organic carbon content, K"oc were in the range 60000 to 110000 mL/g for the six soils, indicating R211133 as ‚immobile" according to the McCall[1] classification scale. The mean Freundlich soil desorption coefficients, K"were in the	

[1] P.J. McCall et al. Measurment of Sorption Coefficients of Organic Chemicals and their use in Environmentla Fate Analysis, Proceedings of a Symposium, Association of Official Analytical Chemists, 21-22 October 1980.

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/03	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
	range 900 to 2800 mL/g in the six soils and the corresponding Freundlich exponents (1/n) for desorption were 0.92 to 1.07. The desorption coefficients were slightly higher than the corresponding adsorption coefficients, indicating that the process of R211133 adsorbing to soil is not entirely reversible. Adsorption coefficients may be overestimated to a small extent as a result of a low recovery of R211133 due to degradation, however the degree of error will not affect the overall conclusion regarding the potential mobility of R211133.	
5.3 Conclusion	Based on the results of this study R211133 can be considered immobile in soil.	
5.3.1 Reliability	1.	
5.3.2 Deficiencies	No.	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/03	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	Not relevant	
Materials and Methods	[redacted]	
Results and discussion	[redacted]	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/03	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
	[redacted]	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/03	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
Conclusion	[redacted]	
Reliability	[redacted]	
Acceptability	[redacted]	
Remarks	--	

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SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/04	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
	1 REFERENCE	
1.1 Reference	Bow, N.L. (2003). Tefluthrin: Adsorption Properties of R119890 and R613840 in Six Soils. Syngenta unpublished report number TMJ4898B	
1.2 Data protection	Yes	
1.2.1 Data owner	Syngenta	
1.2.2 Companies with letter of access	[redacted]	
1.2.3 Criteria for data protection	[redacted]	
	2 GUIDELINES AND QUALITY ASSURANCE	
2.1 Guideline study	No. The study determined the soil distribution coefficient (Kd) in six soil types and derived Koc values for risk assessment purposes. The methods used approximated to those give in OECD 106 guidelines but the full guideline test was not conducted.	
2.2 GLP	No.	
2.3 Deviations	Full guideline test not conducted.	
	3 MATERIALS AND METHODS	
3.1 Test material (radiolabelled)	Not applicable	
3.1.1 Lot/Batch number	Not applicable	
3.1.2 Specification	Not applicable	
3.1.3 Purity	Not applicable	
3.1.4 Further relevant properties	Not applicable	
3.2 Test material (non radiolabelled)	Non-radiolabelled R119890 (1RS)-cis-3-(ZE-2-chloro-3,3,3-trifluoroprop-enyl)-2,2-dimethyl-cyclo propane carboxylic acid.	
3.2.1 Lot/Batch number	Not stated	
3.2.2 Specification	Not stated	
3.2.3 Purity	Not stated	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/04	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
3.2.4 Further relevant properties	The report also contains data on the compound tetrachlorophthalonitrile (R613840). These data are not relevant to *lambda*-cyhalothrin and have not been included in this summary.	X1
3.3 Reference Materials (non radiolabelled)	None specified.	
3.3.1 Lot/Batch number	Not applicable	
3.3.2 Purity	Not applicable	
3.4 Soil types	The characterisation data for the soils is summarised in the following tables.	
3.5 Testing procedure	The sorption properties of the *lambda*-cyhalothrin soil metabolite R119890 were investigated in six soils using the batch equilibrium technique.	
3.5.1 Test system	Tests were conducted in centrifuge tubes.	
3.5.2 Test solution and Test conditions	The test was conducted using calcium chloride solution (0.01M).	
3.6 Test performance	--	
3.6.1 Preliminary test	Not performed.	
3.6.2 Screening test: Adsorption	Aliquots of each soil were partially sterilised by microwave (650W for 3minutes). Soil slurries were prepared using 1 g of soil and 19 mL of calcium chloride, which were equilibrated for 16 hours using an end over end shaker. The samples were then fortified with R119890 at levels of 0.05 and 0.1 µg/mL and shaken for a further 16 hours. The adsorption supernatant was separated by centrifugation and analysed for R119890 by high performance liquid chromatography (HPLC).	X2 X3
3.6.3 Screening test: Desorption	Not performed.	
3.6.4 Definitive study, Freundlich sorption isotherms	Not performed.	
3.6.5 Chromatographic analysis	HPLC analysis used an ACE 5CE (25 cm x 3.2 mm i.d.) column and a water (adjusted to pH2 with orthophosphoric acid): acetonitrile (45:55) isocratic mobile phase (flow rate 0.5mL/min). R119890 was detected by UV absorption at 220 nm.	
	4 RESULTS	
4.1 Preliminary test	Not performed.	
4.2 Screening test: Adsorption	Mean soil adsorption coefficients normalised for organic carbon content, Koc were in the range 9 to 169 mL/g for the six soils,	X4

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/04	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
	indicating R119890 as having „very high" to „medium" mobility according to the McCall[2] classification scale quoted in the report.	X5 X6
4.3 Screening test: Desorption	Not performed.	
4.4 Definitive study, Freundlich sorption isotherms	Not performed.	
4.4.1 Adsorption parameters	Not performed.	
4.4.2 Desorption parameters	Not performed.	
4.4.3 Recovery over duration of study	Not performed.	
4.4.4 Stability over duration of study	Not performed.	
4.5 Degradation product(s)	Degradation products were not identified in the study.	
	5 APPLICANT'S SUMMARY AND CONCLUSION	
5.1 Materials and methods	The sorption properties of R119890 were investigated in six soils using the batch equilibrium technique. The non-GLP screening test was conducted in 2003.	
5.2 Results and discussion	Mean soil adsorption coefficients normalised for organic carbon content, Koc were in the range 9 to 169 mL/g for the six soils, indicating R119890 as having „very high" to „medium" mobility according to the McCall classification scale. Desorption and Freundlich isotherm test were not conducted.	
5.3 Conclusion	Based on the results of this study R119890 can be considered as having „very high" to „medium" mobility in soil.	
5.3.1 Reliability	2	
5.3.2 Deficiencies	No	

[2] P.J. McCall et al. Measurment of Sorption Coefficients of Organic Chemicals and their use in Environmentla Fate Analysis, Proceedings of a Symposium, Association of Official Analytical Chemists, 21-22 October 1980.

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/04	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
	Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	Not relevant	
Materials and Methods	[redacted]	
Results and discussion	[redacted]	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/04	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
	[redacted]	
Conclusion	[redacted]	
Reliability	[redacted]	
Acceptability	[redacted]	
Remarks	[redacted]	

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SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/05	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
	1 REFERENCE	
1.1 Reference	Völkel, W. (2005b). Tefluthrin: Adsorption/Desorption of ^{14}C-PP890 a Metabolite of Tefluthrin and *Lambda*-Cyhalothrin on Three Soils. RCC unpublished report number 856645	
1.2 Data protection	Yes	
1.2.1 Data owner	Syngenta	
1.2.2 Companies with letter of access	[redacted]	
1.2.3 Criteria for data protection	[redacted]	
	2 GUIDELINES AND QUALITY ASSURANCE	
2.1 Guideline study	Yes. Study was conducted to OECD 106 guidelines.	
2.2 GLP	Yes.	
2.3 Deviations	None.	
	3 MATERIALS AND METHODS	
3.1 Test material (radiolabelled)	^{14}C-PP890 (1RS)-cis-3-(Z-2-chloro-3,3,3-trifluoroprop-enyl)-2,2-dimethyl-cyclo propane carboxylic acid.	
3.1.1 Lot/Batch number	[redacted]	
3.1.2 Specification	Specific radioactivity, 2.42 MBq/mg	
3.1.3 Purity	[redacted] (HPLC)	
3.1.4 Further relevant properties	None specified.	X1
3.2 Test material (non radiolabelled)	Non-radiolabelled PP890 (1RS)-cis-3-(Z-2-chloro-3,3,3-trifluoroprop-enyl)-2,2-dimethyl-cyclo propane carboxylic acid.	
3.2.1 Lot/Batch number	[redacted]	
3.2.2 Specification	None stated.	
3.2.3 Purity	[redacted]	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/05	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
3.2.4 Further relevant properties	None specified.	
3.3 Reference Materials (non radiolabelled)	None specified.	
3.3.1 Lot/Batch number	Not applicable	
3.3.2 Purity	Not applicable	
3.4 Soil types	The characterisation data for the soils is summarised in the following tables.	
3.5 Testing procedure	The sorption properties of the *lambda*-cyhalothrin soil metabolite PP890 were investigated in three soils (of European origin) using the batch equilibrium technique.	X2, X3
3.5.1 Test system	Tests were conducted in Teflon centrifuge tubes.	
3.5.2 Test solution and Test conditions	The test was conducted using calcium chloride solution (0.01M).	X4
3.6 Test performance	--	
3.6.1 Preliminary test	Soil slurries were prepared using samples of „18 Acres" (UK), „Gartenacker" (Switzerland) and Marsillargues (France) soil in the ratio of 1:25, 1:5 and 1:1 to establish the appropriate proportion of soil and solution for the definitive test. ^{14}C-PP890 was added to the slurries at a concentration of 0.55 mg/L and the mixtures were shaken for 2, 5, 24 and 48 hour periods at 20°C to establish the equilibrium time. At the end of the adsorption phase, the desorption kinetics were determined (using the 1:1 soil ratio samples only) by replacing the adsorption supernatant with fresh calcium chloride (0.01M) and shaking the resulting slurries as previously described. Control samples (0.01M calcium chloride only) were included in the test to determine the amount of PP890 adsorbed to the vessel sides during equilibration.	
3.6.2 Screening test: Adsorption	Not performed.	
3.6.3 Screening test: Desorption	Not performed.	
3.6.4 Definitive study, Freundlich sorption isotherms	The study was conducted by preparing slurries for each soil types, in duplicate, using 10 g of soil and 9 mL of 0.01M calcium chloride solution (ratio of 1:1 w/v). ^{14}C-PP890 was then added to the slurries, dissolved in 0.01M calcium chloride, to produce PP890 concentrations of 0.020, 0.099, 0.413, 1.017 and 2.024 mg/L. Equilibration was performed by shaking the treated soil slurries on a mechanical shaker for 24 hours at 20°C. After equilibration,	

SECTION IIIA 7	FATE AND BEHAVIOUR IN THE ENVIRONMENT	Official use only
IIIA 7.2.3.1/05	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
	the soil and aqueous layers were separated by centrifugation and the radioactivity in the aqueous layer quantified by LSC. A single desorption step was performed by removing the entire aqueous layer and replenishing it with an equal amount of fresh 0.01M calcium chloride solution. The resulting soil slurries were shaken for a further 24 hour period prior to centrifugation and quantification by LSC. The stability of PP890 during the test was determined by analysing the adsorption supernatants and soil residues from the samples equilibrated at 2.02 mg/L. The adsorption supernatant samples were analysed directly by HPLC. The soil residues were extracted with acetonitrile: water (4:1 v/v) and the extracts analysed by HPLC.	X5 X6
3.6.5 Chromatographic analysis	HPLC analysis used a Li-Chrospher 100 RP18 (25 cm x 4.6 mm i.d.) column with a gradient elution using acetonitrile and water as the mobile phase (flow rate 1.0 mL/min). PP890 was detected using UV adsorption at 217 nm.	
	4 RESULTS	
4.1 Preliminary test	The preliminary test showed that a soil:solution ratio of 1:1 w/v was appropriate for the definitive test. Adsorption and desorption equilibrium was established after 5 hours in each case; however a 24 hour interval was selected for the definitive test to ensure complete equilibration. PP890 was stable in the adsorption and desorption supernatants over the course of the test. No loss of radioactivity to the test vessel sides was observed in the control samples.	X7
4.2 Screening test: Adsorption	Not performed. Information concerning equilibrium time, soil:solution ratio and stability was obtained from the preliminary test.	
4.3 Screening test: Desorption	Not performed. The equilibration period for the desorption phase was set at 24 hours, the same as that used for the adsorption phase.	
4.4 Definitive study, Freundlich sorption isotherms	Freundlich adsorption isotherms were determined for all three soils over a concentration range of 0.02 to 2.024 mg/L (5 concentrations) using a soil to solution ratio of 1:1 w/v and a temperature of 20°C. The resulting adsorption and desorption partition and Freundlich coefficients for each soil are summarised in the following tables.	
4.4.1 Adsorption parameters	The range of soil partition coefficients for the adsorption phases in the three soils over the concentrations used was 0.094 to 2.969 mL/g. The Freundlich soil adsorption coefficients, Kf were 0.079, 0.314 and 3.011 mL/g for the „Marsillargues", „Gartenacker" and „18 Acres" soils, respectively. The corresponding Freundlich exponents (1/n) for adsorption were 0.89, 0.95 and 1.01, respectively.	X8 X9 X10

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IIIA 7.2.3.1/05	**Adsorption and desorption in accordance with new test guideline EC C18 or the corresponding OECD 106 and, where relevant, adsorption and desorption of metabolites and degradation products**	
	Freundlich soil adsorption coefficients normalised for organic carbon content, Kfoc were 13, 14 and 93 mL/g for the three soils, respectively, indicating PP890 as having „high" to „very high" mobility in soil according to the McCall classification scale quoted in the report.	
4.4.2 Desorption parameters	The range of soil partition coefficients for the desorption phases in the three soils over the concentrations used was 0.162 to 3.124 mL/g. The Freundlich soil desorption coefficients, Kf were 0.103, 0.263 and 3.417 mL/g for the „Marsillargues", „Gartenacker" and „18 Acres" soils, respectively. The corresponding Freundlich exponents (1/n) for desorption were 0.82, 0.92 and 1.03, respectively. The desorption coefficients were slightly higher than the corresponding adsorption coefficients, indicating that the process of PP890 adsorbing to soil is not entirely reversible.	
4.4.3 Recovery over duration of study	The amount of radioactivity recovered following the adsorption phase of the test was in the range 92.4 to 102.3%, indicating a complete recovery of the applied material. No loss of radioactivity to the vessels sides was observed in control (calcium chloride only) samples.	
4.4.4 Stability over duration of study	Analysis of aqueous supernatants and soil extracts by HPLC showed the radioactivity was present mainly as PP890 and no significant degradation occurred.	
4.5 Degradation product(s)	Degradation products were not identified in the study.	
	5 APPLICANT'S SUMMARY AND CONCLUSION	
5.1 Materials and methods	The sorption properties of PP890 were investigated in three soils (of European origin) using the batch equilibrium technique. The GLP study was conducted to OECD 106 Guidelines in 2005.	
5.2 Results and discussion	The total recovery of the applied radioactivity was in the range of 92.4 to 102.3%, indicating that no significant loss of radioactivity from the test system occurred during the test. The range of soil partition coefficients for the adsorption phases in the three soils over the concentrations used was 0.094 to 2.969 mL/g. The Freundlich soil adsorption coefficients, Kf were 0.079, 0.314 and 3.011 mL/g for the „Marsillargues", „Gartenacker" and „18 Acres" soils, respectively. The corresponding Freundlich exponents (1/n) for adsorption were 0.89, 0.95 and 1.01, respectively. Freundlich soil adsorption coefficients normalised for organic carbon content, Kfoc were 13, 14 and 93 mL/g for the three soils, respectively, indicating PP890 as having „high" to „very high" mobility in soil according to the McCall classification scale.	X11

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	The Freundlich soil desorption coefficients, Kf were 0.103, 0.263 and 3.417 mL/g for the „Marsillargues", „Gartenacker" and „18 Acres" soils, respectively. The corresponding Freundlich exponents (1/n) for desorption were 0.82, 0.92 and 1.03, respectively. The desorption coefficients were slightly higher than the corresponding adsorption coefficients, indicating that the process of PP890 adsorbing to soil is not entirely reversible.	
5.3 Conclusion	Based on the results of this study PP890 can be considered as having „high" to „very high" mobility in soil.	
5.3.1 Reliability	1	
5.3.2 Deficiencies	No	