Renewal
Assessment Report

beta-cyfluthrin

Bulldock EC 25

Volume 3 – B.8 Environmental fate and behaviour and environmental exposure assessment

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B.8 Environmental fate and behaviour and environmental exposure assessment

Introduction

Bulldock 25 EC, the formulation supporting the renewal of approval of beta-cyfluthrin, was also the representative formulation for first Annex I inclusion of the active substance. Bulldock 25 EC, containing 25 g beta-cyfluthrin/L formulated as an emulsifiable concentrate (EC), is an insecticide used as foliar spray in the field (potatoes and wheat) and greenhouse (tomatoes).

Concentrations of beta-cyfluthrin in various environmental compartments are predicted following the proposed use pattern. The predicted environmental concentrations (PEC) in soil, surface water, sediment, and groundwater following the proposed use pattern are provided.

The GAP of the representative uses of Bulldock 25 EC (25 g/L beta-cyfluthrin) are given in the following table:

Crop	Region	BBCH	Application	Maximum number of applications	Interval (days)	Application rate (g/ha active substance)	Application rate (L/ha product)
potato	North-, Central zone	10 – 49	spray	2	14	2 × 7.5	2 × 0.3
potato	South zone	10 - 49	spray	2	14	2 × 12.5	2 × 0.5
winter wheat	North-, Central zone	49-75 (spring application 11-29 (autumn application)	spray	2	14	2 × 7.5	2 × 0.3
winter wheat	South zone	49-75 (spring application 11-29 (autumn application)	spray	2	14	2 × 12.5	2 × 0.5
spring wheat	North-, Central zone	10 - 75	spray	2	14	2 × 7.5	2 × 0.3
spring wheat	South zone	10 - 75	spray	2	14	2 × 12.5	2 × 0.5
tomato (greenhouse)	all zones	all BBCH	spray	2	14	2 × 17.5	2 × 0.7

B.8.1 Fate and behaviour in soil

B.8.1.1 Rate of degradation in soil

The rate of degradation of Bulldock 25 EC is relying on the information given for the active substance beta-cyfluthrin.

B.8.1.2 Mobility in soil

The data on mobility of Bulldock 25 EC in soil are relying on the information given for the active substance beta-cyfluthrin.

B.8.2 Predicted environmental concentrations in soil (PECs)

The PEC_{soil} estimation for beta-cyfluthrin and its metabolites was provided by the study of Kreschnak 2014 using a DT_{50} of 71.5 days from the field trial in S-France, SFO-kinetic. Another PEC_{soil} calculation is provided in the following by the RMS including an estimation of PEC_{accu}. The PEC is calculated on the basis of the degradation kinetic of a field trial in Germany (HS-kinetic, $DT_{50\ fast}$ 27.8 days, $DT_{50\ slow}$ 142.9 days, t_b 28 days).

B.8.2/1 (Kreschnak 2014)

Reference	:	Kreschnak, C.
Title	:	Predicted environmental concentrations of beta-cyfluthrin and its metabolites in soil after application to various crops in Europe
Year of execution	:	17. 04. 2014
GLP statement	:	not relevant
Guideline	:	not relevant; calculation according FOCUS guidance
Test substance	:	beta-Cyfluthrin
Test system	:	PEC in soil under field conditions

Executive Summary

Predicted environmental concentrations in soil were calculated for beta-cyfluthrin and its soil metabolites FPB-acid and DCVA following the recommendations of FOCUS (1997) and EU Commission (2000). According to the use pattern, single and two-fold foliar spray applications of beta-cyfluthrin to various crops were considered. The initial/maximum concentrations of beta-cyfluthrin as well as the maximum PECs values for the metabolites FPB-acid and DCVA were calculated.

The parameters used in the PEC soil calculation are given in Table B.8.2-1. The application pattern and the calculated PEC are given in Table B.8.2-2. Only the initial maximum values are presented.

Table B.8.2-1: Parameters for PEC_{soil} calculation by Kreschnak 2014

Parameter	beta-cyfluthrin	FPB-acid	DCVA
molecular mass	434.3	232.2	209.1
DT_{50}	71.5	1	8.5
maximum occurrence in soil %	-	12.7	40.5

Table B.8.2-2: PEC_{soil} for beta-cyfluthrin and its metabolites after 2 applications, interval 14 days

Crop	rate (g/ha as)	BBCH code	interception %	PEC_{soil} max (mg/kg)		
				beta-cyfluthrin	FPB-acid	DCVA
potato	7.5	10 – 49	15	0.016	0.001	0.002
potato	12.5	10 – 49	15	0.027	0.001	0.004
wheat	7.5	11 – 29 * 10 – 75 **	25	0.014	0.003	0.004
wheat	12.5		25	0.023	0.005	0.006
tomato	17.5	up to 3 days pre harvest	0 - 50	0.032	0.002	0.005

* autumn application in winter wheat
** spring cereals

Comment

In the study of Kreschnak 2014 the DT_{50} of 71.5 days was used for calculation of PEC_{soil}. This DT_{50} was derived from the field trial in S-France (Robinson 2014a, SFO-kinetics), and was seen as the maximum field DT_{50} out of six field studies conducted by Robinson 2014 a-d in France, Spain and Germany and two field studies conducted by Schmidt & Bachlechner 1991 a-b in Germany. The RMS does not agree. Therefore only the summary of the study by Kreschnak 2014 and the maximum PEC_{soil} are given here.

According to the kinetic re-evaluation of the field studies by the RMS, the trial in Germany with 2 applications in October 2012 is seen as the worst case situation for soil degradation in the field (Robinson 2014d, HS-kinetic, $DT_{50\ fast}$ 27.8 days, $DT_{50\ slow}$ 142.9 days, t_b 28 days). A new PEC_{soil} calculation is therefore provided in the following by the RMS including an estimation of PEC_{accu}.

PEC soil calculation conducted by the RMS

PEC_{soil} calculations are based on the recommendations of the FOCUS workgroup on degradation kinetics. A soil bulk density of 1.5 g/cm^3, a soil depth of 5 cm and a tillage depth of 20 cm (arable crop) were assumed. The PEC_{soil} calculations were performed with ESCAPE 2.0 based on the input parameters for beta-cyfluthrin and its metabolites FPB-acid and DCVA.

Table B.8.2-3: Parameters for PEC soil calculation by RMS

Parameter	beta-cyfluthrin	FPB-acid	DCVA
molecular mass	434.3	232.2	209.1
degradation kinetic for active substance	HS-kinetic, k1 = 0.0249 (DT_{50} 27.8 d), k2 = 0.00485 (DT_{50} 143 d), tb = 28 d (maximum field, Robinson 2014d)		
maximum occurence of metabolites in soil %		12.7	40.5

Beside $PEC_{soil,act}$ values $PEC_{soil,twa}$ values are also required for risk assessment. $PEC_{soil,act}$ and $PEC_{soil,twa}$ values are estimated after two applications of 7.5 g/ha as and two applications of 12.5 g/ha as in potatoes and wheat, respectively, and after two applications of 12.5 g/ha as in tomato.

Table B.8.2-4: Results of PEC_{soil} calculation after two applications of 7.5 g/ha as in potato (soil bulk density 1.5 g/cm^3, soil depth 5 cm)

Plant protection product:			Bulldock (25 g /L beta-cyfluthrin)		
Use:			potato (BBCH 10)		
Number of applications/interval			2, interval 14 days		
Application rate:			7.5 g/ha as		
Crop interception:			15 %		
active substance	**application**	**soil relevant application rate (g/ha)**	**PEC_{act} (mg/kg)**	**tillage depth (cm)**	**PEC_{bkgd} (mg/kg)**
beta-cyfluthrin	every year	2 × 6.38	0.0145	20	0.0003
DCVA			0.0028	-	-
FPB-acid			0.0010	-	-

* a tillage depth of 20 cm was considered for calculating the background concentration

Table B.8.2-5: Results of $PEC_{soil, twa}$ calculation after two applications of 7.5 g/ha as in potato

Time (d)	PEC_{act}* (mg/kg)	PEC_{twa} (mg/kg)	Begin TWA-frame (d)	End TWA-frame (d)
1	0.0141	0.0143	14	15
2	0.0138	0.0141	14	16
4	0.0131	0.0138	14	18
7	0.0122	0.0133	14	21
14	0.0102	0.0122	14	28
21	0.0091	0.0114	13	34
28	0.0082	0.0108	13	41
42	0.0076	0.0098	13	55
50	0.0074	0.0095	13	63
100	0.0058	0.0082	0	100

* $PEC_{soil,act}$ values are related to the time after the second application

TableB.8.2-6: Results of PEC_{soil} calculation after two applications of 12.5 g/ha as in potato (soil bulk density 1.5 g/cm^3, soil depth 5 cm)

Plant protection product:	Bulldock (25 g /L beta-cyfluthrin)
Use:	potato (BBCH 10)
Number of applications/interval	2, interval 14 days

Application rate:			12.5 g/ha as		
Crop interception:			15 %		
active sub-stance	**application**	**soil relevant application rate (g/ha)**	**PEC_{act} (mg/kg)**	**tillage depth (cm)**	**PEC_{bkgd} (mg/kg)**
beta-cyfluthrin	every year	2 × 10.63	0.0242	20	0.0006
DCVA			0.0047	-	-
FPB-acid			0.0016	-	-

* a tillage depth of 20 cm was considered for calculating the background concentration

Table B.8.2-7: Results of $PEC_{soil,\ twa}$ calculation after two applications of 12.5 g/ha as in potato

Time (d)	PEC_{act}* (mg/kg)	PEC_{twa} (mg/kg)	Begin TWA-frame (d)	End TWA-frame (d)
1	0.0241	0.0244	14	15
2	0.0235	0.0241	14	16
4	0.0224	0.0236	14	18
7	0.0208	0.0227	14	21
14	0.0176	0.0209	14	28
21	0.0158	0.0196	13	34
28	0.0142	0.0185	13	41
42	0.0133	0.0169	13	55
50	0.0128	0.0163	13	63
100	0.0102	0.0142	0	100

* $PEC_{soil,act}$ values are related to the time after the second application

Table B.8.2-8: Results of PEC_{soil} calculation after two applications of 7.5 g/ha as in wheat (soil bulk density 1.5 g/cm^3, soil depth 5 cm)

Plant protection product:			Bulldock (25 g /L beta-cyfluthrin)		
Use:			wheat (BBCH 11)		
Number of applications/interval			2, interval 14 days		
Application rate:			7.5 g/ha as		
Crop interception:			25 %		
active sub-stance	**application**	**soil relevant application rate (g/ha)**	**PEC_{act} (mg/kg)**	**tillage depth (cm)**	**PEC_{bkgd} (mg/kg)**
beta-cyfluthrin	every year	2 × 5.63	0.0128	20	0.0003
DCVA			0.0025	-	-
FPB-acid			0.0009	-	-

* a tillage depth of 20 cm was considered for calculating the background concentration

Table B.8.2-9: Results of $PEC_{soil,\ twa}$ calculation after two applications of 7.5 g/ha as in wheat

Time (d)	PEC_{act}* (mg/kg)	PEC_{twa} (mg/kg)	Begin TWA-frame (d)	End TWA-frame (d)
1	0.0128	0.0129	14	15
2	0.0125	0.0128	14	16
4	0.0119	0.0125	14	18
7	0.011	0.012	14	21
14	0.0093	0.0111	14	28
21	0.0083	0.0104	13	34
28	0.0075	0.0098	13	41
42	0.007	0.009	13	55
50	0.0068	0.0086	13	63
100	0.0054	0.0075	0	100

* $PEC_{soil,act}$ values are related to the time after the second application

Table B.8.2-10: Results of PEC_{soil} calculation after two applications of 12.5 g/ha as in wheat (soil bulk density 1.5 g/cm^3, soil depth 5 cm)

Plant protection product:			Bulldock (25 g /L beta-cyfluthrin)		
Use:			wheat (BBCH 11)		
Number of applications/interval			2, interval 14 days		
Application rate:			12.5 g/ha as		
Crop interception:			25 %		
active substance	**application**	**soil relevant application rate (g/ha)**	**PEC_{act} (mg/kg)**	**tillage depth (cm)**	**PEC_{bkgd} (mg/kg)**
beta-cyfluthrin	every year	2 × 9.38	0.0213	20	0.0005
DCVA			0.0042	-	-
FPB-acid			0.0014	-	-

* a tillage depth of 20 cm was considered for calculating the background concentration

Table B.8.2-11: Results of $PEC_{soil, twa}$ calculation after two applications of 12.5 g/ha as in wheat

Time (d)	PEC_{act}* (mg/kg)	PEC_{twa} (mg/kg)	Begin TWA-frame (d)	End TWA-frame (d)
1	0.0213	0.0215	14	15
2	0.0208	0.0213	14	16
4	0.0198	0.0208	14	18
7	0.0184	0.0201	14	21
14	0.0155	0.0185	14	28
21	0.0139	0.0173	13	34
28	0.0125	0.0163	13	41
42	0.0117	0.0149	13	55
50	0.0113	0.0144	13	63
100	0.009	0.0125	0	100

* $PEC_{soil,act}$ values are related to the time after the second application

Table B.8.2-12: Results of PEC_{soil} calculation after two applications of 17.5 g/ha as in tomato (soil bulk density 1.5 g/cm^3, soil depth 5 cm)

Plant protection product:			Bulldock (25 g /L beta-cyfluthrin)		
Use:			tomato (BBCH 19 and 29)		
Number of applications/interval			2, interval 14 days		
Application rate:			17.5 g/ha as		
Crop interception:			50 and 70 %		
active substance	**application**	**soil relevant application rate (g/ha)**	**PEC_{act} (mg/kg)**	**tillage depth (cm)**	**PEC_{bkgd} (mg/kg)**
beta-cyfluthrin	every year	8.75 and 5.25	0.0152	20	0.0004
DCVA			0.0010	-	-
FPB-acid			0.0030	-	-

* a tillage depth of 20 cm was considered for calculating the background concentration

Table B.8.2-13: Results of $PEC_{soil, twa}$ calculation after two applications of 17.5 g/ha as in tomato

Time (d)	PEC_{act}* (mg/kg)	PEC_{twa} (mg/kg)	Begin TWA-frame (d)	End TWA-frame (d)
1	0.0152	0.0154	14	15
2	0.0149	0.0152	14	16
4	0.0141	0.0149	14	18
7	0.0132	0.0143	14	21
14	0.0111	0.0133	13	27
21	0.0101	0.0124	13	34
28	0.0093	0.0118	0	28
42	0.0087	0.0113	0	42
50	0.0084	0.0109	0	50
100	0.0066	0.0094	0	100

* $PEC_{soil,act}$ values are related to the time after the second application

B.8.3 Predicted environmental concentrations in ground water (PEC_{GW})

For the calculation of concentrations in groundwater the active substance beta-cyfluthrin and its major metabolites FPB-acid and DCVA were considered in the study by Kreschnak 2014b.

B.8.3/1 (Kreschnak 2014b)

Reference	:	Kreschnak, C.
Title	:	Predicted environmental concentratos of beta-cyfluthrin and its metabolites in groudwater after application to varoious crops using POCUS PEARL and FOCUS PELMO
Date of execution	:	15. 04. 2014
Test system	:	PEC in groundwater under field conditions
GLP statement	:	not relevant
Guideline	:	not relevant; calculation according FOCUS guidance
Test substance	:	beta-Cyfluthrin

Executive Summary

Predicted environmental concentrations in groundwater were calculated for beta-cyfluthrin and its soil metabolites FPB-acid and DCVA using FOCUS PEARL v4.4.4 and FOCUS PELMO v5.5.3. Up to two foliar applications at rates of 7.5 to 17.5 g as/ha are envisaged for the use on wheat, potato and tomato.

Calculations were conducted for a period of 20 years with applications assumed to occur every year. The 80th percentile PEC_{gw} values in the leachate at 1 m soil depth for beta-cyfluthrin and its metabolites FPB- acid and DCVA were below <0.1 µg/L for all crops and scenarios.

Study Design

Environmental behaviour in soil

For the PEC_{gw} simulations, the geometric mean DT_{50} of 32.2 days for beta-cyfluthrin, 1.3 days for FPB- acid and 4.1 days for DCVA at lower tier following the kinetics evaluation were used. The formation fraction of 0.812 for FPB-acid and 0.872 for DCVA were used for modelling purposes.

The arithmetic mean K_{oc} of 112004 mL/g (corresponding to a K_{om} of 64968) and the default value 1/n of 1.0 for beta-cyfluthrin were used in the modelling. For the metabolite FPB-acid, the arithmetic mean K_{foc} of 136 mL/g (corresponding to a K_{fom} of 79 mL/g) and the arithmetic mean Freundlich exponent of 0.664 were used for modelling.

Adsorption of DCVA is pH dependent. To account for that pH dependency, the minimum K_{foc} of 9 mL/g (corresponding to a K_{fom} of 5.2 mL/g) and the corresponding Freundlich exponent of 0.888 were used for modelling.

Application scenarios

Beta-cyfluthrin is intended to be used on wheat, potato and tomato with up to two foliar spray applications at a maximum rate of 7.5-17.5 g as/ha. The application pattern is presented in Table B.8.3-1.

Table B.8.3-1: Application pattern for PEC_{gw} calculation

Crop	Appl. rate [g as/ha]	Growth stage (BBCH)	No. of appl.	FOCUS crop interception [%]	Resulting soil deposit [g as/ha]	1st Application timing
Winter cereals (autumn application)	7.5 / 7.5	11-29	2	25 / 25	5.625 / 5.625	Emergence
Winter cereals (autumn application)	12.5 / 12.5	11-29	2	25 / 25	9.375 / 9.375	Emergence
Spring cereals	7.5 / 7.5	10-75	2	25 / 25	5.625 / 5.625	Emergence
Spring cereals	12.5 / 12.5	10-75	2	25 / 25	9.375 / 9.375	Emergence
Potato	7.5 / 7.5	10-49	2	15 / 15	6.375 / 6.375	Emergence
Potato	12.5 / 12.5	10-49	2	15 / 15	10.625 / 10.625	Emergence
Tomato	17.5 / 17.5	9-PHI	2	0 / 50	17.5 / 8.75	Emergence

[1)] covering the spring application, no separately calculation for spring application to winter cereals

Table B.8.3-2: Application dates used for modelling

$FOCUS_{gw}$ crop	Scenario	1st application	2nd application
Winter cereals	Châteaudun	26/10/	09/11/
	Hamburg	01/11/	15/11/
	Jokioinen	20/09/	04/10/
	Kremsmünster	05/11/	19/11/
	Okehampton	17/10/	31/10/
	Piacenza	01/12/	15/12/
	Porto	30/11/	14/12/
	Sevilla	30/11/	14/12/
	Thiva	30/11/	14/12/
Spring cereals	Châteaudun	10/03/	24/03/
	Hamburg	01/04/	15/04/
	Jokioinen	18/05/	01/06/
	Kremsmünster	01/04/	15/04/
	Okehampton	01/04/	15/04/
	Porto	10/03/	24/03/
Potatoes	Châteaudun	30/04/	14/05/
	Hamburg	10/05/	24/05/
	Jokioinen	05/06/	19/06/
	Kremsmünster	10/05/	24/05/
	Okehampton	30/04/	14/05/
	Piacenza	20/04/	04/05/
	Porto	15/03/	29/03/
	Sevilla	31/01/	14/02/
	Thiva	01/03/	15/03/
Tomatoes	Châteaudun	10/05/	24/05/
	Piacenza	10/05/	24/05/
	Porto	15/03/	29/03/
	Sevilla	15/04/	29/04/
	Thiva	10/04/	24/04/

Input parameters

A summary of the relevant input data used in the simulations is given in Table 8.3-3. Apart from the input parameters explicitly discussed in the report, all variables in the software model were left at their default values.

Table 8.3-3: Input parameters for beta-cyfluthrin and its metabolites used in the simulations

Parameter	Beta-cyfluthrin	FPB-acid	DCVA
Molecular mass [g/mol]	434.3	232.2	209.1
Half-life in soil (DT_{50}) [days]	32.2 [2)]	1.3 [2)]	4.1 [2)]
Aqueous solubility at 20 °C [mg/L]	0.00185 [8)]	24000	42000
Vapour pressure at 20 °C [Pa]	1.33×10^{-6} [7)]	4.2×10^{-5}	1.3×10^{-2}
K_{foc} [mL/g]	112004 [3)]	136 [3)]	9 [4)]
K_{fom} [mL/g] [1)]	64968	79	5.2
1/n	1 (default)	0.664 [3)]	0.888 [5)]
Transformation fraction in soil [-]	-	0.812 [6)]	0.872 [6)]
Plant uptake factor	0	0	0
Q_{10}-value	2.58	2.58	2.58

1) calculated with Kfoc/1.724
2) geometric mean of laboratory studies
3) arithmetic mean
4) minimum value
5) corresponding to minimum Kfoc
6) formation fraction from beta-cyfluthrin
7) arithmetic mean, from the values of isomers II and IV

Modelling strategy

The following figure shows the proposed degradation pathways of beta-cyfluthrin in soil as considered for the modelling.

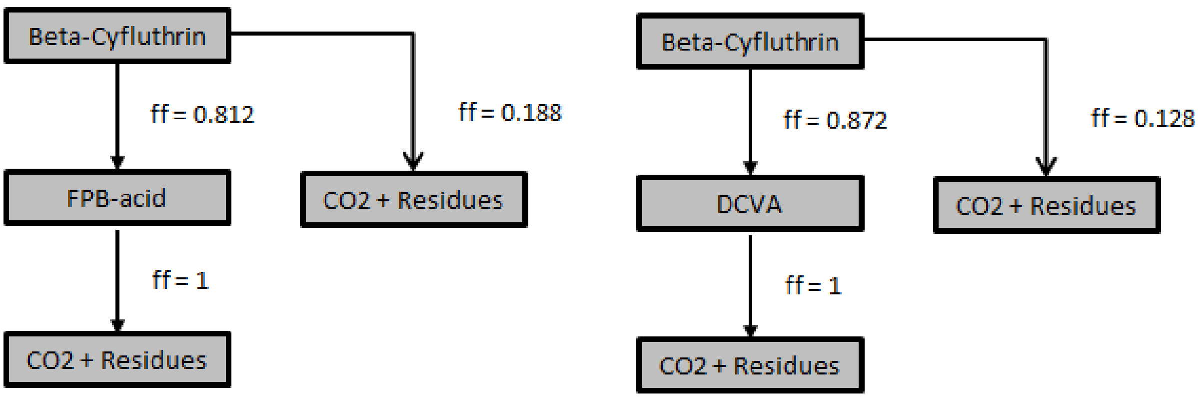

Figure 8.3-1: Pathways of beta-cyfluthrin in soil as considered for modelling

Results and Discussion

The 80th percentile PEC_{gw} values of beta-cyfluthrin and its metabolites FPB-acid and DCVA are given in Table B.8.3-4 to Table B.8.3-10.

Table B.8.3-4: 80th percentile PEC_{gw} at 1 m soil depth for beta-cyfluthrin, FPB-acid and DCVA following autumn application to winter cereals – 2 x 7.5 g as/ha

Crop scenario	Model	Scenario	PEC_{gw} at 1 m soil depth [µg/L]		
			Beta-cyfluthrin	FPB-acid	DCVA
Winter cereals 2 x 7.5 g as/ha	FOCUS PEARL v4.4.4	Châteaudun	<0.001	<0.001	<0.001
		Hamburg	<0.001	<0.001	0.001
		Jokioinen	<0.001	<0.001	<0.001
		Kremsmünster	<0.001	<0.001	<0.001
		Okehampton	<0.001	<0.001	0.001
		Piacenza	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	0.001
		Sevilla	<0.001	<0.001	<0.001
		Thiva	<0.001	<0.001	<0.001
Winter cereals 2 x 7.5 g as/ha	FOCUS PELMO v5.5.3	Châteaudun	<0.001	<0.001	<0.001
		Hamburg	<0.001	<0.001	0.001
		Jokioinen	<0.001	<0.001	0.001
		Kremsmünster	<0.001	<0.001	<0.001
		Okehampton	<0.001	<0.001	0.001
		Piacenza	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	0.001
		Sevilla	<0.001	<0.001	<0.001
		Thiva	<0.001	<0.001	<0.001

Table B.8.3-5: 80th percentile PEC_{gw} at 1 m soil depth for beta-cyfluthrin, FPB-acid and DCVA following autumn application to winter cereals – 2 x 12.5 g as/ha

Crop scenario	Model	Scenario	PEC_{gw} at 1 m soil depth [µg/L]		
			Beta-cyfluthrin	FPB-acid	DCVA
Winter cereals 2 x 12.5 g as/ha	FOCUS PEARL v4.4.4	Châteaudun	<0.001	<0.001	<0.001
		Hamburg	<0.001	<0.001	0.002
		Jokioinen	<0.001	<0.001	0.001
		Kremsmünster	<0.001	<0.001	<0.001
		Okehampton	<0.001	<0.001	0.002
		Piacenza	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	0.002
		Sevilla	<0.001	<0.001	<0.001
		Thiva	<0.001	<0.001	<0.001
Winter cereals 2 x 12.5 g as/ha	FOCUS PELMO v5.5.3	Châteaudun	<0.001	<0.001	<0.001
		Hamburg	<0.001	<0.001	0.001
		Jokioinen	<0.001	<0.001	0.001
		Kremsmünster	<0.001	<0.001	<0.001
		Okehampton	<0.001	<0.001	0.001
		Piacenza	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	0.003
		Sevilla	<0.001	<0.001	<0.001
		Thiva	<0.001	<0.001	<0.001

Table B.8.3-6: 80th percentile PEC_{gw} at 1 m soil depth for beta-cyfluthrin, FPB-acid and DCVA following application to spring cereals - 2 x 7.5 g as/ha

Crop	Model	Scenario	PEC_{gw} at 1 m soil depth [µg/L]		
			Beta-cyfluthrin	FPB-acid	DCVA
Spring cereals 2 x 7.5 g as/ha	FOCUS PEARL v4.4.4	Châteaudun	<0.001	<0.001	<0.001
		Hamburg	<0.001	<0.001	<0.001
		Jokioinen	<0.001	<0.001	<0.001
		Kremsmünster	<0.001	<0.001	<0.001
		Okehampton	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	<0.001
Spring cereals 2 x 7.5 g as/ha	FOCUS PELMO v5.5.3	Châteaudun	<0.001	<0.001	<0.001
		Hamburg	<0.001	<0.001	<0.001
		Jokioinen	<0.001	<0.001	<0.001
		Kremsmünster	<0.001	<0.001	<0.001
		Okehampton	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	<0.001

Table B.8.3-7: 80th percentile PEC_{gw} at 1 m soil depth for beta-cyfluthrin, FPB-acid and DCVA following application to spring cereals - 2 x 12.5 g as/ha

Crop	Model	Scenario	PEC_{gw} at 1 m soil depth [µg/L]		
			Beta-cyfluthrin	FPB-acid	DCVA
Spring cereals 2 x 12.5 g as/ha	FOCUS PEARL v4.4.4	Châteaudun	<0.001	<0.001	<0.001
		Hamburg	<0.001	<0.001	<0.001
		Jokioinen	<0.001	<0.001	<0.001
		Kremsmünster	<0.001	<0.001	<0.001
		Okehampton	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	<0.001
Spring cereals 2 x 12.5 g as/ha	FOCUS PELMO v5.5.3	Châteaudun	<0.001	<0.001	<0.001
		Hamburg	<0.001	<0.001	<0.001
		Jokioinen	<0.001	<0.001	0.001
		Kremsmünster	<0.001	<0.001	<0.001
		Okehampton	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	<0.001

Table B.8.3-8: 80th percentile PEC_{gw} at 1 m soil depth for beta-cyfluthrin, FPB-acid and DCVA following application to potatoes - 2 x 7.5 g as/ha

Crop	Model	Scenario	PEC_{gw} at 1 m soil depth [µg/L]		
			Beta-cyfluthrin	FPB-acid	DCVA
Potatoes 2 x 7.5 g as/ha	FOCUS PEARL v4.4.4	Châteaudun	<0.001	<0.001	<0.001
		Hamburg	<0.001	<0.001	<0.001
		Jokioinen	<0.001	<0.001	<0.001
		Kremsmünster	<0.001	<0.001	<0.001
		Okehampton	<0.001	<0.001	<0.001
		Piacenza	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	<0.001
		Sevilla	<0.001	<0.001	<0.001

		Thiva	<0.001	<0.001	<0.001
Potatoes 2 x 7.5 g as/ha	FOCUS PELMO v5.5.3	Châteaudun	<0.001	<0.001	<0.001
		Hamburg	<0.001	<0.001	<0.001
		Jokioinen	<0.001	<0.001	0.001
		Kremsmünster	<0.001	<0.001	<0.001
		Okehampton	<0.001	<0.001	<0.001
		Piacenza	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	<0.001
		Sevilla	<0.001	<0.001	<0.001

Table B.8.3-9: 80th percentile PEC_{gw} at 1 m soil depth for beta-cyfluthrin, FPB-acid and DCVA following application in potatoes 2 × 12.5 g/ha as

Crop	Model	Scenario	PEC_{gw} at 1 m soil depth [µg/L]		
			Beta-cyfluthrin	FPB-acid	DCVA
Potatoes 2 x 12.5 g as/ha	FOCUS PEARL v4.4.4	Châteaudun	<0.001	<0.001	<0.001
		Hamburg	<0.001	<0.001	0.001
		Jokioinen	<0.001	<0.001	<0.001
		Kremsmünster	<0.001	<0.001	<0.001
		Okehampton	<0.001	<0.001	<0.001
		Piacenza	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	<0.001
		Sevilla	<0.001	<0.001	<0.001
		Thiva	<0.001	<0.001	<0.001
Potatoes 2 x 12.5 g as/ha	FOCUS PELMO v5.5.3	Châteaudun	<0.001	<0.001	<0.001
		Hamburg	<0.001	<0.001	<0.001
		Jokioinen	<0.001	<0.001	<0.001
		Kremsmünster	<0.001	<0.001	<0.001
		Okehampton	<0.001	<0.001	<0.001
		Piacenza	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	<0.001
		Sevilla	<0.001	<0.001	<0.001

Table B.8.3-10: 80th percentile PEC_{gw} at 1 m soil depth for beta-cyfluthrin, FPB-acid and DCVA following application in tomatoes – 2 x 17.5 g as/ha

Crop	Model	Scenario	PEC_{gw} at 1 m soil depth [µg/L]		
			Beta-cyfluthrin	FPB-acid	DCVA
Tomatoes 2 x 17.5 g as/ha	FOCUS PEARL v4.4.4	Châteaudun	<0.001	<0.001	<0.001
		Piacenza	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	<0.001
		Sevilla	<0.001	<0.001	<0.001
		Thiva	<0.001	<0.001	<0.001
Tomatoes 2 x 17.5 g as/ha	FOCUS PELMO v5.5.3	Châteaudun	<0.001	<0.001	<0.001
		Piacenza	<0.001	<0.001	<0.001
		Porto	<0.001	<0.001	<0.001
		Sevilla	<0.001	<0.001	<0.001

Comment

The RMS does not agree in all cases with the input parameters for PEC_{gw} calculation. For water solubility 0.0021 mg/L (instead of 0.00185 mg/L) and for vapour pressure 2.2×10^{-6} Pa (instead of 1.3×10^{-6} Pa) should be used. The isomers II and IV differ in their vapour pressures and water solubilities. For the PEC-calculation for beta-cyfluthrin the RMS proposes not to use the means of the individual values of the two isomers but the highest values for isomer II or isomer IV.

Table B.8.3-11: Water solubility and vapour pressure as input parameters for PEC_{gw} calculation proposed by RMS

Parameter	Beta-cyfluthrin
water solubility (20 °C) mg/L 2.1 µg/L for isomer II	0.0021
vapour pressure (20 °C) 2.2×10^{-6} Pa for isomer II	2.2×10^{-6}

The high sorption of parent and the fast degradation of metabolites have the main influence on leaching of beta-cyfluthrin and its metabolites into groundwater. The calculated PEC_{gw} are in all cases <0.003 µg/L, and it can be expected that the slight deviation of input parameters is of no relevant influence on results.

The RMS does therefore not conduct a new PEC_{gw} calculation.

B.8.4 Fate and behaviour in water and sediment

B.8.4.1 Aerobic mineralisation in surface water

The data on aerobic mineralisation of Bulldock 25 EC in soil rely on the information given for the active substance beta-cyfluthrin.

B.8.4.2 Water/sediment study

The data on water/sediment study of Bulldock 25 EC in soil rely on the information given for the active substance beta-cyfluthrin.

B.8.4.3 Irradiated water/sediment study

The data on irradiated water/sediment study of Bulldock 25 EC in soil rely on the information given for the active substance beta-cyfluthrin.

B.8.5 Predicted environmental concentrations in surface water and sediment (PEC_{SW}, PEC_{SD})

B.8.5.1 Calculation by applicant

The concentrations of beta-cyfluthrin in surface water and sediment after spray drift, run-off and drainage were simulated

B.8.5.1/1 (Spickermann 2014)

Reference	:	Spickermann, G.
Title	:	Estimation of environmental concentraitons of beta-cyfluthrin in surface water after post-emergence applications to cereals, potatoes and tomatoes (indoor use) in eht European Union. FOCUS PEC sw calculations Step 3 - 4
Date of execution	:	08. 04. 2014
Test substance	:	beta-Cyfluthrin
Test system	:	PEC in soil under field conditions
GLP statement	:	not relevant
Guideline	:	not relevant; calculation according FOCUS guidance
Test substance	:	beta-Cyfluthrin

B.8.5.1/2 (Ranke 2014)

Reference	:	Ranke, J.
Title	:	Amendment to: Estimation of environmental concentrations of beta-cyfluthrin in surface water after post-emergence applications to cereals, potatoes and tomatoes (indoor use) in the European Union. Additional Step 4 calculations for cereals and potatoes
Date of execution	:	01 December 2014
Test substance	:	beta-Cyfluthrin
Test system	:	PEC in soil under field conditions
GLP statement	:	not relevant
Guideline	:	not relevant; calculation according FOCUS guidance
Test substance	:	beta-Cyfluthrin

Executive Summary

Predicted environmental concentrations in surface water and sediment (PEC_{sw} and PEC_{sed}) were determined at Step 3 and Step 4 for the active substance beta-cyfluthrin. The simulations were performed for use on wheat, potatoes and tomatoes, using FOCUS SWASH version 3.1 for Step 3 calculations and SWAN version 3.0.0 for Step 4 calculations. At Step 4, no-sprayed buffer zones and nozzle reduction due to drift reducing nozzle technology were taken into account for beta-cyfluthrin. Buffer zones (5 m, 10 m, 15 m and 20 m) and nozzle reductions of 50 %, 75 % and 90 % were considered. Drift mitigation and nozzle reduction were considered separately for all FOCUS scenarios. Single and two-fold application (14-day interval) of 7.5 and 12.5 g as/ha to winter- and spring cereals and potatoes and a two-fold indoor application (14-day interval) of 17.5 g as/ha to tomatoes (fruiting vegetables) were considered in the simulations.

For the use in winter cereals a maximum concentration of 0.074 µg/L beta-cyfluthrin was predicted at Step 3 for autumn and spring application. At Step 4, the maximum PEC_{sw} assuming 5 m drift buffer was 0.025 µg/L for autumn and spring application. When 50 % drift reducing nozzles are considered the maximum PEC_{sw} was 0.037 µg/L beta-cyfluthrin for autumn and spring application.

For the use in **spring cereals** a maximum concentration of 0.073 µg/L beta-cyfluthrin was predicted at Step 3. At Step 4, the maximum PEC_{sw} assuming 5 m drift buffer was 0.021 µg/L. When 50 % drift reducing nozzles are considered, the maximum PEC_{sw} was 0.037 µg/L beta-cyfluthrin.

For the use in **potatoes** a maximum PEC_{sw} of 0.06 µg/L beta-cyfluthrin was predicted at Step 3. At Step 4, the maximum PEC_{sw} assuming 5 m drift buffer was 0.025 µg/L. When 50 % drift reducing nozzles are considered, the maximum PEC_{sw} was 0.03 µg/L.

For the use in **tomatoes** a maximum concentration of 0.005 µg/L beta-cyfluthrin was predicted at Step 3 and at Step 4 with a 5 m drift buffer.

Materials and Methods

The input parameters for the PEC_{sw} and PEC_{sed} simulations are given in Table B.8.5-1 The application scenarios are given in Table B.8.5-2 together with the results.

Table B.8.5-1: Input parameters for $FOCUS_{SW}$ used by Spickermann 2014

Parameter	Value
molecular weight g/mol	434.3
water solubility (20 °C) mg/L mean of 2.1 and 1.6 µg/L for isomers II and IV	0.00185
vapour pressure (20 °C) Pa mean of 4.5×10^{-7} and 2.2×10^{-6} Pa for isomers II and IV	1.33×10^{-6}
DT_{50} soil geomean n = 4	32.2
MACRO temp. exponent reference temperature °C PRZM Q_{10}	0.095 20 2.58
reference moisture moisture exponent	pF2 0.7
K_{oc} mean n = 5	112004
1/n	1.0
DT_{50} water geomean total aquatic system (n = 2)	27.6
DT_{50} sediment geomean total aquatic system (n = 2)	34.1
DT_{50} crop	10
TOXSWA activation energy J/mol reference temperature °C	65400 20
crop uptake	0
wash-off coefficient PRZM 1/cm	0.5
wash-off coefficient MACRO 1/mm	0.05

Results

In Table B.8.5-2 to Table B.8.5-6 the results of $FOCUS_{SW}$ calculations Step 3 and Step 4 from the study by Spickermann 2014 are given for winter cereals (spring and autumn application 2 × 7.5 g), spring cereals and potatoes (2 × 7.5 g/ha as) and tomatoes (2 × 7.5 g/ha as).

Table B.8.5-2: PEC_{sw} (µg/L) for beta-cyfluthrin in winter cereals, autumn application 2 ×7.5 g/ha as

Scenario	Step 3	Step 4						
		Drift buffer zone				Nozzle reduction		
		5 m	10 m	15 m	20 m	50 %	75 %	90 %
D1 ditch	0.043	0.011	0.006	0.004	0.003	0.022	0.011	0.004
D1 stream	0.034	0.012	0.006	0.004	0.003	0.017	0.008	0.003
D2 ditch	0.039	0.010	0.005	0.003	0.003	0.019	0.010	0.004
D2 stream	0.031	0.011	0.006	0.004	0.003	0.016	0.008	0.003
D3 ditch	0.038	0.010	0.005	0.003	0.003	0.019	0.010	0.004

D4 pond	0.002	0.001	0.001	0.001	0.001	0.001	<0.001	<0.001
D4 stream	0.033	0.012	0.006	0.004	0.003	0.016	0.008	0.003
D5 pond	0.002	0.001	0.001	0.001	0.001	0.001	<0.001	<0.001
D5 stream	0.035	0.012	0.006	0.004	0.003	0.018	0.009	0.003
D6 ditch	0.039	0.010	0.005	0.003	0.003	0.019	0.010	0.004
R1 pond	0.002	0.002	0.001	0.001	0.001	0.001	<0.001	<0.001 (runoff)
R1 stream	0.025	0.009	0.004	0.003	0.002	0.013	0.006	0.002
R3 stream	0.035	0.012	0.006	0.005	0.003	0.018	0.009	0.004
R4 stream	0.025	0.009	0.004	0.003	0.002	0.013	0.006	0.002

Table B.8.5-3: PEC$_{sw}$ (µg/L) for beta-cyfluthrin in winter cereals, spring application 2 ×7.5 g/ha as

Scenario	Step 3	Step 4						
		Drift buffer zone				Nozzle reduction		
		5 m	10 m	15 m	20 m	50 %	75 %	90 %
D1 ditch	0.041	0.011	0.006	0.004	0.003	0.021	0.010	0.004
D1 stream	0.033	0.012	0.006	0.004	0.003	0.017	0.008	0.003
D2 ditch	0.039	0.010	0.005	0.003	0.003	0.019	0.010	0.004
D2 stream	0.034	0.012	0.006	0.004	0.003	0.017	0.009	0.003
D3 ditch	0.038	0.010	0.005	0.003	0.003	0.019	0.010	0.004
D4 pond	0.002	0.001	0.001	0.001	0.001	0.001	<0.001	<0.001
D4 stream	0.029	0.010	0.005	0.004	0.003	0.015	0.007	0.003
D5 pond	0.002	0.002	0.001	0.001	0.001	0.001	<0.001	<0.001
D5 stream	0.033	0.012	0.006	0.004	0.003	0.017	0.008	0.003
D6 ditch	0.039	0.010	0.005	0.003	0.003	0.019	0.010	0.004
R1 pond	0.001	0.001	0.001	0.001	0.001	0.001	<0.001	<0.001
R1 stream	0.025	0.009	0.004	0.003	0.002	0.013	0.006	0.002
R3 stream	0.035	0.012	0.006	0.004	0.003	0.018	0.009	0.003
R4 stream	0.025	0.009	0.004	0.003	0.002	0.013	0.006	0.002

Table B.8.5-4: PEC$_{sw}$ (µg/L) for beta-cyfluthrin in spring cereals, 2 ×7.5 g/ha as

Scenario	Relevant entry route	Step 4						
		Drift buffer zone				Nozzle reduction		
		5 m	10 m	15 m	20 m	50 %	75 %	90 %
D1 ditch	Drift	0.010	0.005	0.003	0.003	0.020	0.010	0.004
D1 stream	Drift	0.012	0.006	0.004	0.003	0.017	0.008	0.003
D3 ditch	Drift	0.010	0.005	0.003	0.003	0.019	0.010	0.004
D4 pond	Drift	0.001	0.001	0.001	0.001	0.001	<0.001	<0.001
D4 stream	Drift	0.011	0.006	0.004	0.003	0.016	0.008	0.003
D5 pond	Drift	0.002	0.001	0.001	0.001	0.001	<0.001	<0.001
D5 stream	Drift	0.012	0.006	0.004	0.003	0.017	0.008	0.003
R4 stream	Drift	0.009	0.004	0.003	0.002	0.013	0.006	0.002

Table B.8.5-5: PEC$_{sw}$ (µg/L) for beta-cyfluthrin in potato, 2 ×7.5 g/ha as

Scenario	Step 3	Step 4						
		Drift buffer zone				Nozzle reduction		
		5 m	10 m	15 m	20 m	50 %	75 %	90 %
D3 ditch	0.031	0.010	0.005	0.003	0.003	0.016	0.008	0.003
D4 pond	0.001	0.001	0.001	0.001	0.001	0.001	<0.001	<0.001
D4 stream	0.026	0.011	0.005	0.004	0.003	0.013	0.007	0.003
D6 ditch	0.031	0.010	0.005	0.003	0.003	0.016	0.008	0.003
D6 ditch 2nd	0.031	0.010	0.005	0.003	0.003	0.016	0.008	0.003
R1 pond	0.001	0.001	0.001	0.001	0.001	0.001	<0.001	<0.001
R1 stream	0.022	0.009	0.004	0.003	0.002	0.011	0.005	0.002
R2 stream	0.029	0.012	0.006	0.004	0.003	0.014	0.007	0.003
R3 stream	0.030	0.012	0.006	0.004	0.003	0.015	0.008	0.003

Table B.8.5-6: PEC$_{sw}$ (µg/L) for beta-cyfluthrin in tomato, 2 ×17.5 g/ha as (nozzle reduction not calculated)

Scenario	Step 3	Step 4						
		Drift buffer zone				Nozzle reduction		
		5 m	10 m	15 m	20 m	50 %	75 %	90 %
D6	0.004	0.001	<0.001	<0.001	<0.001	nc	nc	nc
R2	0.003	0.001	0.001	0.001	0.001	nc	nc	nc
R3	0.003	0.002	0.002	0.002	0.002	nc	nc	nc
R4	0.005	0.005	0.005	0.005	0.005	nc	nc	nc

In the amendment by Ranke 2014 further drift and runoff mitigation measures are calculated in FOCUS Step 4: drift buffer zone of 50 m and 60 m, nozzle reduction up to 95 %, 10 m vegetated filter strip and a combination of drift buffer zone plus nozzle reduction plus vegetated filter strip. As a result a strong reduction of PEC$_{sw}$ could be achieved. Five examples from the study by Ranke 2914 are given in Table B.8.5-7.

Table B.8.5-7: PEC$_{sw}$ (µg/L) calculated in FOCUS Step 4 by Ranke 2914

Crop	Scenario	Step 3	Mitigation measure	Step 4	% Reduction of PEC
winter cereals, autumn application 2 × 12.5 g/ha as	D1 ditch	0.0717	60 m drift buffer zone	0.0017	97.6
winter cereals, spring application 2 × 12.5 g/ha as	D2 ditch	0.0649	60 m drift buffer zone	0.0015	97.7
spring cereals 2 × 12.5 g/ha as	D1 ditch	0.0653	60 m drift buffer zone	0.0015	97.8
potatos 2 × 12.5 g/ha as	D6 ditch	0.0520	60 m drift buffer zone	0.0015	97.1
potatos 2 × 12.5 g/ha as	R1 stream	0.0360	75 % nozzle reduction + 15 m drift buffer zone + 10 m vegetated filter strip	0.0014	96.1

Conclusion

For reasons of clarity and simplicity not all results from the calculations conducted by Spickermann 2014 and Ranke 2014 are given here.

The RMS does not fully agree with the Step-3-input parameter used in the study by Spickermann 2014. The vapour pressure, the water solubility, the DT_{50} for sediment and the wash-off factors are seen differently by the RMS.

The isomers II and IV differ in their vapour pressures and water solubilities. For the PEC-calculation for beta-cyfluthrin the RMS proposes not to use the means of the individual values of the two isomers but the highest values for isomer II.

Due to the very low water solubility of beta-cyfluthrin, the wash-off factors of 0.02 for PRZM and 0.002 for MACRO are used instead of default values that are only appropriate for water solubility > 8 g/L.

From the water-sediment study, it is clear that beta-cyfluthrin is very quickly transferred from water to sediment ($DissT_{50}$ = 0.5 days). It can be assumed that under these experimental conditions no degradation in the water phase takes place. The $DissT_{50}$ for sediment (34.1 days) is most probably a combination of two processes, the degradation and the transfer from sediment to water. The rate of degradation in the sediment is unknown. The only information about the degradation is given by the DT_{50} for the whole system (27.6 days); the degradation most probably happens at the sediment-water-interface. Due to these uncertainties, the $DegT_{50}$ (27.6 days) is attributed to the sediment and a conservative $DegT_{50}$ of 1000 days as default is attributed to the water phase.

Generally, the type and degree of risk mitigation measures accepted and applied in the European Member States is not sufficiently known. As the RMS is of the opinion that 20 m drift buffer zone and 75 % or 90 % nozzle drift reduction are widely accepted and are applicable in agricultural practice, these parameters are used for $FOCUS_{SW}$ Step 4 calculations. It is easily understandable that increasing drift buffer zones (up to 60 m or even more), nozzle drift reduction of > 90 % or a combination of both measures sooner or later reduces the PEC in surface water to an acceptable level. Since the maximum acceptable and applied drift buffer zone as well as the nozzle drift reduction in Europe is not known, a calculation considering a higher degree of risk mitigation measures than 20 m drift buffer and 90 % nozzle reduction was not made.

B.8.5.2 Calculation by RMS

A new $FOCUS_{SW}$ Step 3 and Step 4 (20 m buffer zone plus 90 % nozzle drift reduction) calculation was conducted by the RMS. The input-parameters are given in Table B.8.5.2-1. The program versions used by RMS are: SWASH 3.1, MACRO 4.4.2, PRZM 3.1.1, TOXWA 3.3.1 and SWAN 3.0.0.

Table B.8.5-8: Input parameters for $FOCUS_{SW}$ used by RMS

Parameter	Value
molecular weight g/mol	434.3
water solubility (20 °C) mg/L 2.1 µg/L for isomer II	0.0021
vapour pressure (20 °C) 2.2×10^{-6} Pa for isomer II	2.2×10^{-6}
DT_{50} soil geomean n = 4	32.2

MACRO temp. exponent reference temperature °C PRZM Q_{10}	0.095 20 2.58
reference moisture moisture exponent	pF2 0.7
K_{oc} mean n = 5	112004
1/n	1.0
DT_{50} water FOCUS default	1000
DT_{50} sediment geomean total aquatic system (n = 2)	27.6
DT_{50} crop	10
TOXSWA activation energy J/mol reference temperature °C	65400 20
crop uptake	0
wash-off coefficient PRZM 1/cm	0.02
wash-off coefficient MACRO 1/mm	0.002

The results of FOCUS SW Step 3 and Step 4 calculation for the field use of Bulldock EC 25 in potato and wheat 2 × 7.5 g/ha as are given as global maxima of actual concentrations in water layer and sediment. For reasons of clarity and simplicity, the concentrations due to applications of 2 × 12.5 g/ha as are not given in this volume. For FOCUS SW Step 3 the PEC in water layer and sediment follow the corresponding 1.67-fold increase of application rates. The PEC calculated by FOCUS SW Step 4 are given in Vol. B.9, chapter B.9.4.3 (refined risk assessment).

Further details about the time-dependent decrease of maximum concentrations and about the time weighted averaged exposure concentrations in water and sediment are given for use in potato. It can be seen from the following tables that scenarios in potato are those which meet the lowest PEC.

Table B.8.5-9: Global maximum of actual concentrations of beta-cyfluthrin in water layer (µg/L) and sediment (µg/kg) FOCUS-SW Step 3 calculation for 2 × 7.5 g/ha as in potato

Location	Type of Water Body	Applications	Water µg/L	Sediment µg/kg
D3	ditch	14 May, 14 Jun	0.03140	0.1220
D4	pond	22 May, 21 Jun	0.00141	0.0280
D4	stream	22 May, 21 Jun	0.02640	0.03230
D6	ditch	23 Aug, 06 Sep	0.03110	0.09160
D6	ditch	23 Apr, 07 May	0.03120	0.09930
R1	pond	09 May, 13 Jun	0.00141	0.03740
R1	stream	09 May, 13 Jun	0.02160	0.5150
R2	stream	22 Mar, 22 Apr	0.02850	0.5000
R3	stream	11 Apr, 25 Apr	0.03040	0.2530

Table B.8.5-10: Global maximum of actual concentrations of beta-cyfluthrin in water layer (µg/L) and sediment (µg/kg) FOCUS-SW Step 3 calculation for 2 × 7.5 g/ha as autumn application in winter cereals

Location	Type of Water Body	Applications	Water µg/L	Sediment µg/kg
D1	stream	03 Oct, 23 Oct	0.03350	0.1450
D1	ditch	03 Oct, 23 Oct	0.04320	0.4520
D2	ditch	03 Nov, 28 Nov	0.03860	0.2210
D2	stream	03 Nov, 28 Nov	0.03290	0.09070
D3	ditch	22 Nov, 10 Dec	0.03810	0.1410

D4	stream	28 Sep, 26 Oct	0.03270	0.0850
D4	pond	28 Sep, 26 Oct	0.00152	0.0340
D5	stream	27 Nov, 18 Dec	0.03530	0.1030
D5	pond	27 Nov, 18 Dec	0.001610	0.03530
D6	ditch	06 Dec, 30 Dec	0.03850	0.1950
R1	stream	14 Nov, 28 Nov	0.02490	0.3480
R1	pond	14 Nov, 28 Nov	0.00170	0.04780
R3	stream	17 Nov, 05 Dec	0.0350	3.1180
R4	stream	10 Nov, 10 Dec	0.0250	0.3090

Table B.8.5-11: Global maximum of actual concentrations of beta-cyfluthrin in water layer (µg/L) and sediment (µg/kg) FOCUS-SW Step 3 calculation for 2 × 7.5 g/ha as spring application in winter cereals

Location	Type of Water Body	Applications	Water µg/L	Sediment µg/kg
D1	stream	25 Apr, 14 May	0.03350	0.12700
D1	ditch	25 Apr, 14 May	0.04170	0.40000
D2	ditch	15 Mar, 01 Apr	0.03880	0.25100
D2	stream	15 Mar, 01 Apr	0.03410	0.17500
D3	ditch	16 Mar, 04 Apr	0.03830	0.15700
D4	pond	19 Mar, 18 Apr	0.00154	0.03450
D4	stream	19 Mar, 18 Apr	0.03000	0.03260
D5	pond	08 Apr, 22 Apr	0.00168	0.03300
D5	stream	08 Apr, 22 Apr	0.03320	0.04430
D6	ditch	27 Feb, 14 Mar	0.03850	0.17900
R1	stream	17 Mar, 26 Apr	0.02500	0.20100
R1	pond	17 Mar, 26 Apr	0.00147	0.03550
R3	stream	19 Feb, 20 Mar	0.03520	0.09630
R4	stream	02 Mar, 16 Mar	0.02500	0.31100

Table B.8.5-12: Global maximum of actual concentrations of beta-cyfluthrin in water layer (µg/L) and sediment (µg/kg) FOCUS-SW Step 3 calculation for 2 × 7.5 g/ha as in spring cereals

Location	Type of Water Body	Applications	Water µg/L	Sediment µg/kg
D1	ditch	14 May, 17 Jun	0.0391	0.245
D1	stream	14 May, 17 Jun	0.0335	0.120
D3	ditch	04 Apr, 20 Apr	0.0383	0.160
D4	pond	26 Apr, 30 May	0.00150	0.0277
D4	stream	26 Apr, 30 May	0.0313	0.0473
D5	pond	8 Apr, 22 Apr	0.00170	0.0312
D5	stream	8 Apr, 22 Apr	0.0324	0.0365
R4	stream	21 Mar, 24 Apr	0.0250	0.0316

Table B.8.5-13: Global maximum of actual concentrations of beta-cyfluthrin in water layer (µg/L) and sediment (µg/kg) FOCUS-SW Step 4 calculation for 2 × 7.5 g/ha as in potato, 20 m drift buffer zone plus 90 % nozzle reduction

Location	Type of Water Body	Applications	Water µg/L	Sediment µg/kg
D3	ditch	14 May, 14 Jun	0.0003020	0.001180
D4	pond	22 May, 21 Jun	0.0001090	0.002150
D4	stream	22 May, 21 Jun	0.0002750	0.0003360
D6	ditch	23 Aug, 06 Sep	0.0002990	0.0008840
D6	ditch	23 Apr, 07 May	0.0003000	0.0009580

R1	pond	09 May, 13 Jun	0.0001120	0.002850
R1	stream	09 May, 13 Jun	0.0002250	0.0260
R2	stream	22 Mar, 22 Apr	0.0002970	-
R3	stream	11 Apr, 25 Apr	0.0003180	0.01290

Table B.8.5-14: Global maximum of actual concentrations of beta-cyfluthrin in water layer (µg/L) and sediment (µg/kg) FOCUS-SW Step 4 calculation for 2 × 7.5 g/ha as autumn application in winter cereals, 20 m drift buffer zone plus 90 % nozzle reduction

Location	Type of Water Body	Applications	Water µg/L	Sediment µg/kg
D1	stream	03 Oct, 23 Oct	0.0003010	0.001310
D1	ditch	03 Oct, 23 Oct	0.0003420	0.003580
D2	ditch	03 Nov, 28 Nov	0.0003060	0.001750
D2	stream	03 Nov, 28 Nov	0.0002950	0.000815
D3	ditch	22 Nov, 10 Dec	0.0003020	0.001110
D4	stream	28 Sep, 26 Oct	0.0002940	0.000746
D4	pond	28 Sep, 26 Oct	0.0001130	0.002530
D5	stream	27 Nov, 18 Dec	0.0003170	0.000929
D5	pond	27 Nov, 18 Dec	0.0001200	0.002630
D6	ditch	06 Dec, 30 Dec	0.0003050	0.001550
R1	stream	14 Nov, 28 Nov	0.0003360	0.01850
R1	pond	14 Nov, 28 Nov	0.0001270	0.003930
R3	stream	17 Nov, 05 Dec	0.0003600	0.1550
R4	stream	10 Nov, 10 Dec	0.0002760	0.2980

Table B.8.5-15: Global maximum of actual concentrations of beta-cyfluthrin in water layer (µg/L) and sediment (µg/kg) FOCUS-SW Step 4 calculation for 2 × 7.5 g/ha as spring application in winter cereals, 20 m drift buffer zone plus 90 % nozzle reduction

Location	Type of Water Body	Applications	Water µg/L	Sediment µg/kg
D1	stream	25 Apr, 14 May	0.0003010	0.001140
D1	ditch	25 Apr, 14 May	0.00030	0.003160
D2	ditch	15 Mar, 01 Apr	0.0003070	0.001990
D2	stream	15 Mar, 01 Apr	0.0003060	0.001570
D3	ditch	16 Mar, 04 Apr	0.0003030	0.001270
D4	pond	19 Mar, 18 Apr	0.0001140	0.002570
D4	stream	19 Mar, 18 Apr	0.0002690	0.0002930
D5	pond	08 Apr, 22 Apr	0.0001250	0.002450
D5	stream	08 Apr, 22 Apr	0.0002980	0.0003980
D6	ditch	27 Feb, 14 Mar	0.0003050	0.001420
R1	stream	17 Mar, 26 Apr	0.0002240	0.01010
R1	pond	17 Mar, 26 Apr	0.000110	0.002640
R3	stream	19 Feb, 20 Mar	0.0003170	0.004180
R4	stream	02 Mar, 16 Mar	0.0002830	0.0170

Table B.8.5-16: Global maximum of actual concentrations of beta-cyfluthrin in water layer (µg/L) and sediment (µg/kg) FOCUS-SW Step 4 calculation for 2 × 7.5 g/ha as in spring cereals, 20 m drift buffer zone plus 90 % nozzle reduction

Location	Type of Water Body	Applications	Water µg/L	Sediment µg/kg
D1	ditch	14 May, 17 Jun	0.000309	0.00194
D1	stream	14 May, 17 Jun	0.000301	0.00108

D3	ditch	04 Apr, 20 Apr	0.000303	0.00127
D4	pond	26 Apr, 30 May	0.000111	0.00206
D4	stream	26 Apr, 30 May	0.000281	0.000425
D5	pond	8 Apr, 22 Apr	0.000127	0.00232
D5	stream	8 Apr, 22 Apr	0.000291	0.000328
R4	stream	21 Mar, 24 Apr	0.000282	0.0180

Table B.8.5-17: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 3 calculation for 2 × 7.5 g/ha as in potato, D3 ditch

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.0314	-	0.114	-
1	0.00949	0.0162	0.0945	0.110
2	0.00344	0.0112	0.0766	0.103
4	0.000889	0.00648	0.0576	0.0878
7	0.000309	0.00393	0.0439	0.0731
14	0.000087	0.00205	0.0291	0.0551
21	0.00004	0.00139	0.0212	0.0453
28	0.000021	0.00105	0.0161	0.0388
42	0.000116	0.00131	0.00984	0.0403
50	0.000044	0.00111	0.00763	0.0385
100	0.000003	0.00056	0.0021	0.0247

Table B.8.5-18: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 4 calculation for 2 × 7.5 g/ha as in potato, 20 m drift buffer zone plus 90 % nozzle reduction, D3 ditch

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.000302	-	0.00110	-
1	0.000092	0.000157	0.000911	0.00106
2	0.000033	0.000108	0.000738	0.000989
4	0.000009	0.000063	0.000555	0.000846
7	0.000003	0.000038	0.000423	0.000705
14	0.000001	0.000020	0.000281	0.000531
21	0.000000	0.000013	0.000205	0.000437
28	0.000000	0.000010	0.000155	0.000374
42	0.000001	0.000013	0.000095	0.000388
50	0.000000	0.000011	0.000074	0.000371
100	0.000000	0.000005	0.000020	0.000238

Table B.8.5-19: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 3 calculation for 2 × 7.5 g/ha as in potato, D4 pond

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.00143	-	0.0252	-
1	0.00114	0.00123	0.0251	0.0252
2	0.00103	0.00115	0.0250	0.0252
4	0.000892	0.00105	0.0246	0.0252
7	0.000761	0.000955	0.0238	0.0250
14	0.000559	0.000805	0.0217	0.0246
21	0.000429	0.000700	0.0194	0.0240
28	0.000332	0.000620	0.0172	0.0232
42	0.000208	0.000571	0.0135	0.0215
50	0.000166	0.000563	0.0118	0.0204
100	0.000056	0.000390	0.00605	0.0166

Table B.8.5-20: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 4 calculation for 2 × 7.5 g/ha as in potato, 20 m drift buffer zone plus 90 % nozzle reduction, D4 pond

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.000110	-	0.00194	-
1	0.000087	0.000095	0.00193	0.00194
2	0.000079	0.000089	0.00192	0.00194
4	0.000069	0.000081	0.00189	0.00193
7	0.000059	0.000073	0.00183	0.00193
14	0.000043	0.000062	0.00167	0.00189
21	0.000033	0.000054	0.0015	0.00185
28	0.000026	0.000048	0.00133	0.00179
42	0.000016	0.000044	0.00104	0.00165
50	0.000013	0.000043	0.000904	0.00157
100	0.000004	0.000095	0.000465	0.00128

Table B.8.5-21: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 3 calculation for 2 × 7.5 g/ha as in potato, D4 stream

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.0264	-	0.0323	-
1	0.000025	0.00214	0.00789	0.0148
2	0.000008	0.00108	0.00552	0.0108
4	0.000003	0.000541	0.00383	0.00768
7	0.000001	0.000310	0.00279	0.00579
14	0.000000	0.000155	0.00179	0.00401
21	0.000000	0.000104	0.00132	0.00319
28	0.000000	0.000078	0.00103	0.00268
42	0.000000	0.000077	0.00155	0.00264
50	0.000000	0.000064	0.00112	0.00243
100	0.000000	0.000032	0.000280	0.00150

Table B.8.5-22: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 4 calculation for 2 × 7.5 g/ha as in potato, 20 m drift buffer zone plus 90 % nozzle reduction, D4 stream

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.000275	-	0.000336	-
1	0.000000	0.000022	0.000082	0.000154
2	0.000000	0.000011	0.000057	0.000112
4	0.000000	0.000006	0.00004	0.000080
7	0.000000	0.000003	0.000029	0.000060
14	0.000000	0.000002	0.000019	0.000042
21	0.000000	0.000001	0.000014	0.000033
28	0.000000	0.000001	0.000011	0.000028
42	0.000000	0.000001	0.000016	0.000027
50	0.000000	0.000001	0.000012	0.000025
100	0.000000	0.000000	0.000003	0.000016

Table B.8.5-23: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 3 calculation for 2 × 7.5 g/ha as in potato, D6 ditch, application 23 Apr, 07 May

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.0311	-	0.0970	-
1	0.00463	0.0134	0.0714	0.0901
2	0.00132	0.00799	0.0554	0.0796
4	0.000469	0.00438	0.0411	0.0651
7	0.000194	0.00263	0.0308	0.0531
14	0.000045	0.00137	0.0193	0.0391
21	0.000023	0.00135	0.0137	0.0316
28	0.000014	0.00104	0.00994	0.0286
42	0.000009	0.000700	0.00533	0.0239
50	0.000004	0.000590	0.00380	0.0214
100	0.000000	0.000297	0.000444	0.0122

Table B.8.5-24: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 4 calculation for 2 × 7.5 g/ha as in potato, 20 m drift buffer zone plus 90 % nozzle reduction, D6 ditch, application 23 Apr, 07 May

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.00030	-	0.000935	-
1	0.000045	0.000129	0.000689	0.000869
2	0.000013	0.000077	0.000534	0.000767
4	0.000005	0.000042	0.000396	0.000628
7	0.000002	0.000025	0.000297	0.000512
14	0.000000	0.000013	0.000187	0.000377
21	0.000000	0.000013	0.000133	0.000305
28	0.000000	0.000010	0.000096	0.000276
42	0.000000	0.000007	0.000051	0.000230
50	0.000000	0.000006	0.000037	0.000206
100	0.000000	0.000003	0.000004	0.000117

Table B.8.5-25: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 3 calculation for 2 × 7.5 g/ha as in potato, D6 ditch, application 23 Aug, 06 Sep

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.0310	-	0.0881	-
1	0.00293	0.0117	0.0576	0.0788
2	0.000720	0.00657	0.0428	0.0667
4	0.000258	0.00350	0.0305	0.0524
7	0.000067	0.00206	0.0216	0.0414
14	0.000036	0.00105	0.0130	0.0293
21	0.000016	0.00110	0.00876	0.0236
28	0.000010	0.000837	0.00644	0.0220
42	0.000012	0.000564	0.00415	0.0177
50	0.000004	0.000475	0.00321	0.0158
100	0.000003	0.000239	0.00128	0.00926

Table B.8.5-26: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 4 calculation for 2 × 7.5 g/ha as in potato, 20 m drift buffer zone plus 90 % nozzle reduction, D6 ditch, application 23 Aug, 06 Sep

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.000299	-	0.000850	-
1	0.000028	0.000112	0.000556	0.000760
2	0.000007	0.000063	0.000412	0.000643
4	0.000002	0.000034	0.000295	0.000506
7	0.000001	0.000020	0.000208	0.000400
14	0.000000	0.000010	0.000125	0.000282
21	0.000000	0.000011	0.000084	0.000228
28	0.000000	0.000008	0.000062	0.000212
42	0.000000	0.000005	0.000040	0.000171
50	0.000000	0.000005	0.000031	0.000153
100	0.000000	0.000002	0.000012	0.000089

Table B.8.5-27: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 3 calculation for 2 × 7.5 g/ha as in potato, R1 pond

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.00143	-	0.0321	-
1	0.00113	0.00123	0.0320	0.0321
2	0.00103	0.00115	0.0319	0.0321
4	0.000888	0.00105	0.0315	0.0319
7	0.000753	0.000951	0.0307	0.0317
14	0.000579	0.000810	0.0278	0.0307
21	0.000446	0.000710	0.0246	0.0299
28	0.000347	0.000631	0.0217	0.0290
42	0.000221	0.000534	0.0169	0.0267
50	0.000177	0.000553	0.0143	0.0254
100	0.000068	0.000410	0.00995	0.0207

Table B.8.5-28: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 4 calculation for 2 × 7.5 g/ha as in potato, 20 m drift buffer zone plus 90 % nozzle reduction, R1 pond

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.000113	-	0.00245	-
1	0.000090	0.000098	0.00245	0.00245
2	0.000082	0.000092	0.00244	0.00245
4	0.000071	0.000084	0.00241	0.00245
7	0.000060	0.000076	0.00235	0.00243
14	0.000050	0.000067	0.00212	0.00237
21	0.000038	0.000059	0.00188	0.00231
28	0.000030	0.000053	0.00166	0.00224
42	0.000019	0.000044	0.00129	0.00208
50	0.000016	0.000046	0.00109	0.00198
100	0.000008	0.000034	0.000775	0.00161

Table B.8.5-29: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 3 calculation for 2 × 7.5 g/ha as in potato, R1 stream

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.0216	-	0.203	-
1	0.000133	0.00430	0.197	0.200
2	0.000039	0.00219	0.192	0.197
4	0.000014	0.00110	0.185	0.193
7	0.000006	0.000635	0.175	0.188
14	0.000006	0.000367	0.152	0.181
21	0.000003	0.000248	0.131	0.177
28	0.000002	0.000208	0.114	0.174
42	0.000001	0.000200	0.0942	0.168
50	0.000005	0.000182	0.0782	0.164
100	0.000003	0.000096	0.128	0.158

Table B.8.5-30: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 4 calculation for 2 × 7.5 g/ha as in potato, 20 m drift buffer zone plus 90 % nozzle reduction, R1 stream

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.000225	-	0.0108	-
1	0.000002	0.000143	0.0101	0.0105
2	0.000001	0.000076	0.00982	0.0103
4	0.000000	0.000039	0.00937	0.00994
7	0.000000	0.000023	0.00883	0.00959
14	0.000001	0.000017	0.00763	0.00911
21	0.000000	0.000012	0.00656	0.00892
28	0.000000	0.000013	0.00578	0.00878
42	0.000000	0.000011	0.00486	0.00848
50	0.000001	0.000010	0.00398	0.00827
100	0.000000	0.000006	0.00651	0.00797

Table B.8.5-31: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 3 calculation for 2 × 7.5 g/ha as in potato, R2 stream

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.0285	-	0.260	-
1	0.000035	0.00249	0.254	0.257
2	0.000012	0.00125	0.249	0.254
4	0.000005	0.000631	0.240	0.250
7	0.000003	0.000363	0.227	0.243
14	0.000006	0.000196	0.200	0.229
21	0.000239	0.000144	0.176	0.215
28	0.000001	0.000109	0.209	0.205
42	0.000001	0.000133	0.152	0.197
50	0.000008	0.000115	0.127	0.188
100	0.000001	0.000062	0.0436	0.167

Table B.8.5-32: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 4 calculation for 2 × 7.5 g/ha as in potato, 20 m drift buffer zone plus 90 % nozzle reduction, R2 stream

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.000297	-	0.0133	-
1	0.000000	0.000048	0.0128	0.0130
2	0.000000	0.000027	0.0126	0.0129
4	0.000000	0.000020	0.0121	0.0126
7	0.000000	0.000015	0.0114	0.0122
14	0.000001	0.000008	0.0100	0.0115
21	0.000055	0.000007	0.00882	0.0108
28	0.000000	0.000005	0.0105	0.0103
42	0.000000	0.000005	0.00762	0.00991
50	0.000001	0.000004	0.00637	0.00946
100	0.000000	0.000003	0.00219	0.00837

Table B.8.5-33: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 3 calculation for 2 × 7.5 g/ha as in potato, R3 stream

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.0304	-	0.165	-
1	0.00107	0.00931	0.125	0.148
2	0.000266	0.00493	0.113	0.135
4	0.000087	0.00254	0.102	0.123
7	0.000036	0.00153	0.0928	0.119
14	0.000014	0.000811	0.0782	0.114
21	0.000766	0.00103	0.0822	0.110
28	0.000852	0.000776	0.0889	0.107
42	0.000005	0.000542	0.0660	0.101
50	0.000003	0.000470	0.0544	0.0973
100	0.000005	0.000252	0.0762	0.0889

Table B.8.5-34: Actual and time weighted average concentrations of beta-cyfluthrin, FOCUS SW Step 4 calculation for 2 × 7.5 g/ha as in potato, 20 m drift buffer zone plus 90 % nozzle reduction, R3 stream

Day	Water µg/L		Sediment µg/kg	
	actual	twa	actual	twa
maximum	0.000318	-	0.00700	-
1	0.000012	0.000165	0.00665	0.00685
2	0.000004	0.000100	0.00648	0.00671
4	0.000002	0.000053	0.00606	0.00650
7	0.000001	0.000046	0.00555	0.00623
14	0.000000	0.000026	0.00586	0.00597
21	0.000184	0.000021	0.00474	0.00576
28	0.000202	0.000017	0.00511	0.00557
42	0.000001	0.000017	0.00355	0.00526
50	0.000000	0.000016	0.00289	0.00508
100	0.000001	0.000012	0.000766	0.00443

Conclusion

After the application of 2 × 7.5 g/ha as the PEC for beta-cyfluthrin calculated by FOCUS SW Step 3 are between 0.0014 µg/L and 0.0388 µg/L in water and between 0.028 µg/kg and 3.12 µg/kg in sediment. After the application of 2 × 12.5 g/ha as the PEC for beta-cyfluthrin are between 0.0024 µg/L and 0.0672 µg/L in water and between 0.0462 µg/kg and 5.2 µg/kg in sediment. According to the calculation by $FOCUS_{SW}$ Step 4 there is a maximum reduction of PEC in water layer by 95 % due to mitigation measures (20 m buffer zone plus 90 % nozzle drift reduction).

According to the calculations by Ranke 2014 a reduction of PEC in water layer of 97.8 % can be realised by a 60 m buffer zone. The RMS does not know which mitigation measures are acceptable and practically applied in Europe such Step-4-calculations are not conducted by the RMS.

B.8.6 Fate and behaviour in air

B.8.6.1 Route and rate of degradation in air and transport via air

The data on degradation in air and transport via air rely on the information given for the active substance beta-cyfluthrin.

B.8.6.2 Predicted environmental concentrations from airborne transport

The data on airborne transport rely on the information given for the active substance beta-cyfluthrin.

B.8.7 Predicted environmental concentrations from other routes of exposure

The data on other routes are relying on the information given for the active substance beta-cyfluthrin.

B.8.8 References relied on

Reference list of non-vertebrate studies sorted by Annex point

Annex point/ reference number	Author(s)	Year	Title Report No. Source (where different from company) GLP status (where relevant) published or not	Vertebrate study	Data protection claimed	Justification	Owner
KCP Section 9/01	Hoerger, F., Kenaga, E. E.	1972	Pesticide residues on plants: Correlation of representative data as a basis for estimation of their magnitude in the environment Edition No: M-001228-01-1 Source: Environmental Quality and Safety, Editors: Coulston, F.; F. Korte, pp. 9 - 28 Not GLP published	N	N	-	-public data-
KCP 9.1.1.2.1/ 01	Schmidt & Bachlechner	1991a	FCR 4545; 25 EC; Boden; Deutschland Report No.: 0197-89 Edition No: M-033990-01-1 Bayer AG, Leverkusen, Germany Not GLP not published	N	N		BCS
KCP 9.1.1.2.1/ 02	Schmidt & Bachlechner	1991b	FCR 4545; 25 EC; Boden; Deutschland Report No.: 0204-89 Edition No: M-033962-01-1 Bayer AG, Leverkusen, Germany Not GLP not published	N	N		BCS

Annex point/ reference number	Author(s)	Year	Title Report No. Source (where different from company) GLP status (where relevant) published or not	Vertebrate study	Data protection claimed	Justification	Owner
KCP 9.1.1.2.1/ 03	Spickermann, G.	2014a	Beta-cyfluthrin – temperature influence on dissipation behaviour Eurofins Regulatory AG, Rheinfelden, Switzerland Report No: E-RA0157-E Not GLP not published	N	Y	New PEC calculation	IRV
KCP 9.1.3/01	Schad, T.	1998	Predicted environmental concentrations of cyfluthrin in soil based on calculations using PELMO. Bayer Crop Science AG Report No.: MR-675/98 Edition No.: M-059712-01-1; R-19349 Not GLP Not published	N	Y	-	BCS
KCP 9.1.3/02	Kreschnak, C.	2014a	Predicted environmental concentrations of beta-cyfluthrin and its metabolites in soil after application to various crops in Europe Report No.: 321014-1 Edition No.: R-34710 Dr. Knoell Consult GmbH Not GLP not published	N	Y	New PEC calculation	IRV

Annex point/ reference number	Author(s)	Year	Title Report No. Source (where different from company) GLP status (where relevant) published or not	Vertebrate study	Data protection claimed	Justification	Owner
KCP 9.1.3/03	Spickermann, G.	2014b	Kinetic evaluation (trigger endpoints) according to FOCUS kinetics (2011) - soil field dissipation trials for beta-cyfluthrin Eurofins Regulatory AG, Rheinfelden, Switzerland Report No: ERA0157-D Not GLP not published	N	Y	New PEC calculation	IRV
KCP 9.2.4/01	Schaefer, H., Krauskopf, B.	1995	Predicted environmental concentration of the cyfluthrin metabolite DCVA (permethric acid) in ground water recharge based on the calculation of PELMO. Bayer Crop Science AG Report No.: MR-1112/95 Edition No.: R-19350 Not GLP Not published	N	N	-	BCS
KCP 9.2.4.1/01	Kreschnak, C.	2014b	Predicted environmental concentrations of beta-cyfluthrin and its metabolites in groundwater after application to various crops using the FOCUS PEARL and FOCUS PELMO Report No.: 321014-2 Edition No.: R-34709 Dr. Knoell Consult GmbH, Mannheim, Germany Not GLP not published	N	Y	New PEC calculation	IRV

Annex point/ reference number	Author(s)	Year	Title Report No. Source (where different from company) GLP status (where relevant) published or not	Vertebrate study	Data protection claimed	Justification	Owner
KCP 9.2.4.2/01	Caspers, N., Mueller, G.	1994	Studies on the ecological behaviour of Bulldock Bayer AG, Leverkusen, Germany Edition No: M-053009-01-2 GLP not published	N	N	-	BCS
KCP 9.2.5/01	Schaefer, H.	2001	Predicted environmental concentration of beta-cyfluthrin in surface water based on calculations with EXAMS. Bayer AG, Leverkusen, Germany Report No.: MR-573/00 Edition No: R-19152 Not GLP not published	N	N	-	BCS
KCP 9.2.5/02	Rawn, G. P., Webster, G. R. B., Muir, D. C. G.	1982	Fate of permethrin in model outdoor ponds Journal of Environmental Science and Health Edition No: M-090183-01-1 Not GLP published	N	N	-	-public data-
KCP 9.2.5/03	Anon.	2000	Bekanntmachung des Verzeichnisses risikomindernder Anwendungsbedingungen fuer Nichtzielorganismen Edition No: M-058623-01-1 Not GLP published	N	N	-	-public data-

Annex point/ reference number	**Author(s)**	**Year**	**Title** **Report No.** **Source** (where different from company) **GLP status** (where relevant) **published or not**	**Vertebrate study**	**Data protection claimed**	**Justification**	**Owner**
KCP 9.2.5/04	Schad, T.	1998	Predicted environmental concentrations of cyfluthrin in soil based on calculations using PELMO Bayer Crop Science AG Report No.: MR-675/98 Edition No.: M-059712-01-1; R-19349 Not GLP Not published ...also filed: KCP 9.1.3/01	N	N	-	BCS
KCP 9.2.5/05	Schaefer, H., Jersch-Schmitz, S.	1996	Predicted environmental concentration of beta-cyfluthrin in surface water based on calculations with EXAMS Edition No: M-053270-01-1 Not GLP not published	N	N	-	BCS
KCP 9.2.5/06	Kreschnak, C.	2014c	Predicted environmental concentrations of beta-cyfluthrin and its metabolites in surface water and sediment after application to various crops using the FOCUS surface water scenarios at Steps 1 and 2 Report No.: 321014-3 Edition No.: R-34711 Dr. Knoell Consult GmbH, Mannheim, Germany Not GLP not published	N	Y	New PEC calculation	IRV

Annex point/ reference number	Author(s)	Year	Title Report No. Source (where different from company) GLP status (where relevant) published or not	Vertebrate study	Data protection claimed	Justification	Owner
KCP 9.2.5/07	Spickermann, G.	2014c	Estimation of environmental concentrations of beta-cyfluthrin in surface water after post-emergence application to cereals, potatoes and tomatoes (indoor use) in the European Union Eurofins Regulatory AG, Rheinfelden, Switzerland Report No.:ERA0157-A Edition No.: R-34693 Not GLP not published	N	Y	New PEC calculation	IRV

IRV = Irvita Plant Protection, Curacao – a member of Makhteshim Agan Holding B.V., The Netherlands
BCS = Bayer CropScience AG, Monheim, Germany

Studies submitted for the Annex I inclusion of beta-cyfluthrin and already evaluated at EU level are listed in grey (owner Bayer CropScience, license Irvita Plant Protection B.V.).

Studies submitted for the first time in support of the renewal approval of beta-cyfluthrin are listed in black.

Reference list of vertebrate studies sorted by Annex point

There are no vertebrate studies submitted in support of this Section.