Bayer CropScience

Document Title

Summary of the fate and behaviour in the environment for Prothioconazole

Data Requirements

EU Regulation 1107/2009 & EU Regulation 283/2013
Document MCA
Section 7: Fate and behaviour in the environment

According to the guidance document, SANCO 10181/2013, for preparing dossiers for the approval of a chemical active substance

Date

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Author(s)

[redacted]

Bayer CropScience

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Version history

Date	Data points containing amendments or additions[1] and brief description	Document identifier and version number

[1] It is suggested that applicants adopt a similar approach to showing revisions and version history as outlined in SANCO/10180/2013 Chapter 4 How to revise an Assessment Report

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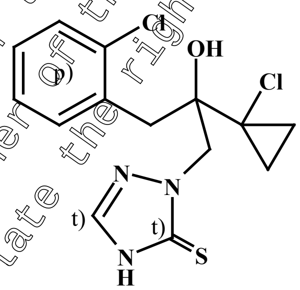
CA 7 FATE AND BEHAVIOUR IN THE ENVIRONMENT

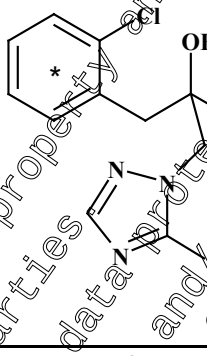
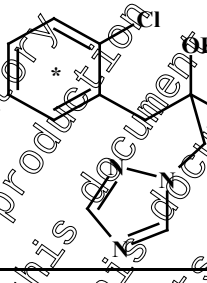
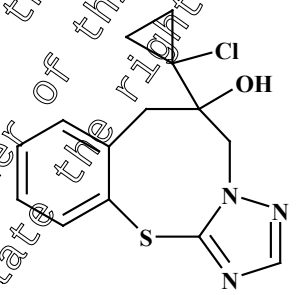
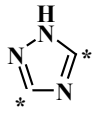
A dossier on prothioconazole (CAS No. 178928-70-6) was submitted February 2002 by Bayer CropScience to the EU RMS United Kingdom for agricultural use as a fungicide. Prothioconazole was included into Annex I of the Council Directive 91/414/EEC by the Commission Directive 2008/44/EC published 4 April 2008, with an entry into force by 1 August 2008.
Data on the fate and behaviour of prothioconazole (JAU 6476) in soil, water, sediment and air were submitted within the EU Dossier (Baseline Dossier). In this Supplemental Dossier for renewal of approval of prothioconazole presented here, only those environmental fate studies are described detail in sections 7.1 to 7.5, which were not submitted within the Baseline Dossier.
In addition, summaries of the already EU reviewed studies which are basic for the understanding of the behaviour of prothioconazole in soil, water and sediment are also presented here. These summaries are taken directly from the Baseline Dossier in the primary format mentioned there (only changes in numbering of tables). In order to allow differentiation between supplemental information and data already EU reviewed, the supplemental information is written in black letters whereas grey letters describe the original information.

The studies concerning the fate and behaviour of prothioconazole in the environment were conducted using two different radiolabel positions, [phenyl-UL-^{14}C] and [3,5-triazole-^{14}C], as well as unlabelled prothioconazole. These radiolabel positions are sufficient to define the route of degradation of prothioconazole. The structure of prothioconazole and the positions of the different radiolabels are as follows:

Structural formula of prothioconazole (JAU 6476): p): ^{14}C-labeling position of the **phenyl-label** (short form used in this summary) = [phenyl-UL-^{14}C]JAU 6476 t): ^{14}C-labeling position of the **triazole-label** (short form used in this summary) = [3,5-triazole-^{14}C]JAU 6476	

The results of the studies are summarized in the following sections 7.1 to 7.5. The proposed degradation pathways in soil, water and sediment are given in Figure 7.1.1-1 and Figure 7.2-1, respectively.

In addition, studies have been performed with the radiolabelled and/or unlabelled metabolites JAU 6476-S-methyl *(M01)*, JAU 6476-desthio *(M04)*, JAU 6476-thiazocine *(M12)* and 1,2,4-triazole *(M13)*:

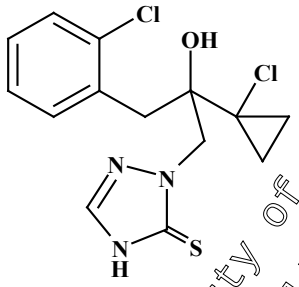
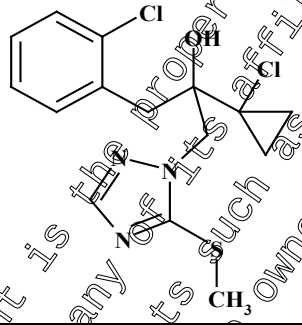
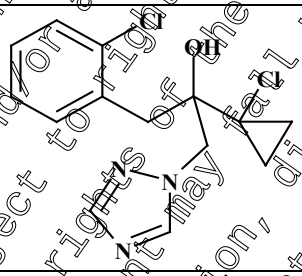
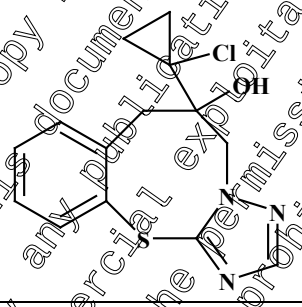
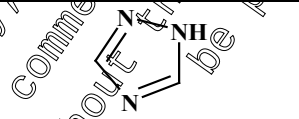
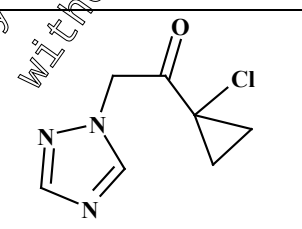
Structural formula of JAU 6476-S-methyl *(M01)*: *: ^{14}C-labeling position of the **phenyl-labelled** JAU 6476-S-methyl *(M01)* (short form used in this summary) = [phenyl-UL-^{14}C]JAU 6476-S-methyl *(M01)*	
Structural formula of JAU 6476-desthio *(M04)*: *: ^{14}C-labeling position of the **phenyl-labelled** JAU 6476-desthio *(M04)* (short form used in this summary) = [phenyl-UL-^{14}C]JAU 6476-desthio *(M04)*	
Structural formula of JAU 6476-thiazocine *(M12)*: - unlabelled compound was used	
Structural formula of 1,2,4-triazole *(M13)*: *: ^{14}C-labeling position of the **triazole-label** (short form used in this summary) = triazole-3,5-triazole-^{14}C	

In original reports study authors may have used different names or codes for degradation products of prothioconazole. In this summary a single name or a single code is used for each degradation product. A full list containing structural formula, various names, short forms, codes and occurrences of degradation products is provided as Document N3.

Compounds addressed in this document

In addition to the active substance, the following metabolites were addressed in this document as they were considered important due to the amounts in which they were found during the course of environmental fate studies.

Active substance(s) and metabolite(s) addressed in this document

Compound / Codes	Chemical structure	Explanation for consideration
Prothioconazole (JAU 6476)		active substance
JAU 6476-S-methyl *(M01)*		occurrence in - aerobic soil (> 10%) - water/sediment (> 10%)
JAU 6476-desthio *(M04)*		occurrence in - aerobic soil (> 10%) - water/sediment (> 10%)
JAU 6476-thiazocine *(M12)*		occurrence in - aqueous photolysis (> 10%)
1,2,4-triazole *(M13)*		occurrence in - aerobic soil (< LOQ) - water/sediment (> 10%)
JAU 6476-triazolylketone *(M42)*		occurrence in - water/sediment (> 5% in sediment, increasing at study end)

CA 7.1 Fate and behaviour in soil

Prothioconazole is rapidly degraded in soil under aerobic conditions to the major degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* to final degradation product carbon dioxide and non-extractable residues. Under anaerobic conditions JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* and non-extractable residues were also identified. In presents of light prothioconazole is degraded rapidly with JAU 6476-desthio *(M04)* as major degradation product. However, the fast degradation observed for the dark control revealed photolysis not to be the dominant process of degradation. More details for route and rate of prothioconazole and its major degradation products in soil are given in section CA 7.1.1 and section CA 7.1.2, respectively.

CA 7.1.1 Route of degradation in soil

Summary: Route of degradation in soil

The route of degradation of prothioconazole in soil was studied using two different radiolabel positions, phenyl- and triazole-label. The studies have been performed in a number of soils in the laboratory at 20°C and different soil moistures. The maximum occurrences of degradation products in percentage of applied radioactivity [%AR] are given as means of duplicates and may slightly differ from the List of Endpoints (EFSA Scientific Report (2007) 106, 1-98, 12 July 2007).

From the studies on the route of degradation in soil under aerobic conditions, it can be concluded that prothioconazole was rapidly degraded in soil under aerobic conditions to the final degradation product CO_2 (5.5 to 17.9% of the applied radioactivity (AR) for the phenyl-label and a maximum amount of 0.7 to 5.3%AR for the triazole-label). In parallel to mineralisation, bound residues (NER) were formed (40.5 to 47.3%AR for the phenyl-label and 44.7 to 56.4%AR for the triazole-label). A total of eight metabolites were identified or characterised in the soil extracts along with the parent compound and $^{14}CO_2$. The major metabolites (> 10%AR or > 5%AR at 2 or more sequential sampling points or > 5%AR increasing at the study end) were JAU 6476-S-methyl *(M01)* with a maximum of 14.6%AR and JAU 6476-desthio *(M04)* with max. 49.4%AR, which were both degradable under aerobic conditions and thoroughly metabolised to carbon dioxide. JAU 6476-sulfonic acid *(M02)*, JAU 6476-triazolinone *(M03)*, 1,2,4-triazole *(M13)*, JAU 6476-desthio-3-hydroxy *(M14)* (also as mixture of JAU 6476-desthio-3-hydroxy *(M14)*, JAU 6476-desthio-4-hydroxy *(M15)* and JAU 6476-desthio-5-hydroxy *(M16)*), JAU 6476-desthio-6-hydroxy *(M17)* and 2-chlorobenzoic acid *(M20)* were found as minor metabolites.
The proposed pathway of degradation of prothioconazole is dominated by reactions at the sulphur atom of the triazole ring (*e.g.* oxidation, methylation, loss of sulphur or exchange of sulphur against oxygen).

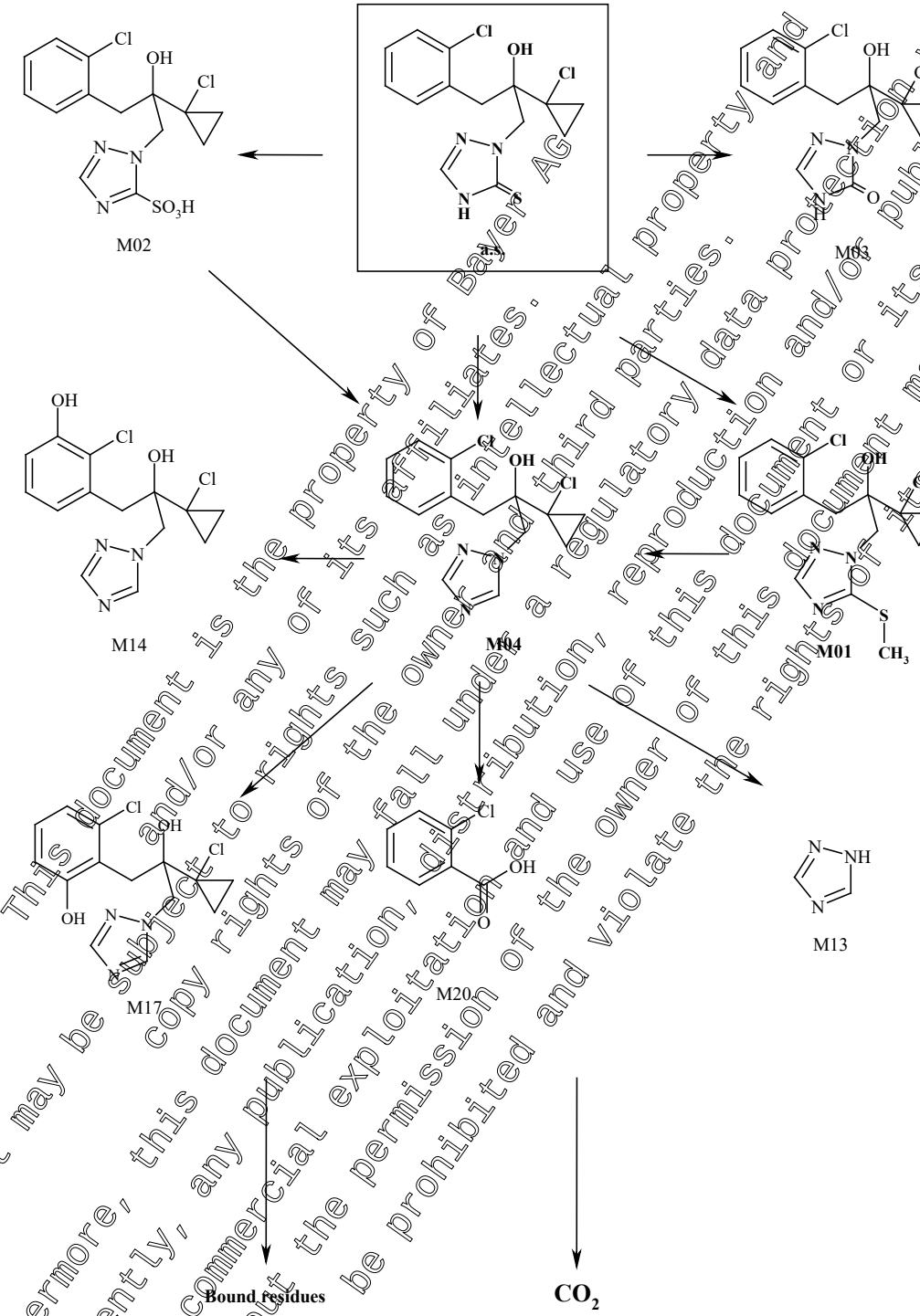
Under anaerobic conditions in the dark in the laboratory JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* were identified as major degradation products in the anaerobic phase with a maximum amount of 33.7 and 23.5% AR, respectively. Formation of carbon dioxide was ≤ 0.1%AR. NER reached a maximum amount of 40.2%AR. The following possible processes are involved in the pathway of degradation of prothioconazole: methylation of the sulphur-atom to JAU 6476-S-methyl*(M01)*, elimination of the sulphur-atom of prothioconazole and the S-methyl group of JAU 6476-S-methyl to result in JAU 6476-desthio *(M04)* and formation of non-extractable residues.

A photodegradation study on soil surfaces demonstrated that prothioconazole is degraded rapidly on soil surfaces if irradiated by simulated sunlight. However, the fast degradation observed for the dark control

revealed photolysis not to be the dominant process of degradation. The only major degradation product observed in the irradiated samples as well as in the dark controls was identified as JAU 6476-desthio *(M04)* with a maximum amount of 38.5%AR. Formation of carbon dioxide was very low with a maximum amount of 0.7% AR. NER reached a maximum amount of 25.5%AR.
The DT_{50} (expressed as solar summer days in Phoenix) was 14.7 days.
A new kinetic evaluation according to FOCUS kinetics (2014) gives a trigger endpoint of 0.77 days and a normalised modelling endpoint of 8.8 days for prothioconazole (both environmental days under summer sunlight conditions at Athens/Greece).

The proposed degradation pathway of prothioconazole in soil is shown in Figure 7.1.1-1.

Figure 7.1.1-1: Proposed degradation pathway of prothioconazole in soil (major soil metabolites are mentioned in bold letters)



a.s. = prothioconazole
M01 = JAU 6476-S-methyl
M02 = JAU 6476-sulfonic acid
M03 = JAU 6476-triazolinone
M04 = JAU 6476-desthio

M13 = 1,2,4-triazole
M14 = JAU 6476-desthio-3-hydroxy
M17 = JAU 6476-desthio-6-hydroxy
M20 = 2-chlorobenzoic acid

CA 7.1.1.1 Aerobic degradation

The route of degradation of prothioconazole in soil under aerobic conditions in the laboratory was evaluated during the Annex I inclusion using two radiolabel positions (phenyl- and triazole-label). In addition the route of degradation of the two major metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* in soil under aerobic conditions was also investigated. All studies were accepted by the European Commission (EFSA Scientific Report (2007) 106, 1-98, 12 July 2007). The following studies are included in the Baseline Dossier:

Compound Annex Point / Reference No	Author(s)	Year	Document No.
Protionconazole			
KCA 7.1.1.1 /01	[redacted], M.; [redacted], P.	2000, rev. 2002	M-023328-03-1
KCA 7.1.1.1 /02	[redacted], E.	2001	M-061584-01-1
JAU 6476-S-methyl *(M01)*			
KCA 7.1.1.1 /03	[redacted], M.	2001	M-056651-02-1
JAU 6476-desthio *(M04)*			
KCA 7.1.1.1 /04	[redacted], M.	2001	M-056633-02-1

For a better understanding of the route of degradation of prothioconazole in soil under aerobic conditions the summaries of the two aerobic soil metabolism of prothioconazole (KCA 7.1.1.1 /01 and KCA 7.1.1.1 /02) as given in the Baseline Dossier are repeated below (grey coloured). Changes in these evaluations - based on *e.g* change of trigger values in the new regulation EC no. 1107/2009[1] - are distinguished in black to show them as revised information.

No additional studies are submitted within this Supplemental Dossier for the prothioconazole renewal of approval. A summary of the route of degradation of prothioconazole in soil is given in section CA 7.1.1 and Figure 7.1.1-1.

[1] Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC
Official Journal of the European Union L 309, 24.11.2009

Report:	**KCA 7.1.1.1 /01; [redacted], M.; [redacted], P.; 2001**
Title:	Aerobic degradation of JAU 6476 in two soils
Report No:	MR-549/99
Document No:	M-023328-03-1
Guidelines:	- Commission Directive 95/36/EC of 14 July 1995 amending Council Directive 91/414/EEC concerning the placing of plant protection products on the market, Official Journal of the European Communities no. L172, 22/07/1995 - SETAC-Europe: Procedures for Assessing the Environmental Fate and Ecotoxicity of Pesticides, March 1995
GLP:	Yes

Test System: The aerobic soil metabolism of JAU 6476 was investigated in two soils ([redacted], a sandy loam and Stanley, a silty clay loam) using the phenyl labelled active substance. For JAU 6476 a maximum field use rate of 200 g active substance per hectare and per single treatment with a maximum of three treatments per season is anticipated. Based on the conversion according to relevant US EPA Guidelines the seasonal area rate of 600 g a.s./ha was calculated for a soil depth of 1 cm and a bulk density of 1.5 g/cm³. This corresponded to a concentration of 26.7 µg a.s./100 g soil (dry weight). The conversion according to the BBA Guideline (single use rate of 200 g a.s./ha, soil depth of 5 cm, bulk density of 1.5 g/cm³), yielded the same concentration.
The soil samples were treated directly as it would happen during a spray application. The application was performed by dosing aliquots of 500 µL of application solution in small droplets using a microlitre syringe onto the soil contained in the test vessels. Then the anticipated soil moisture of 48% of WHC_{max} was adjusted. The radioactivity recovered from the day 0 vessels was defined as the applied amount.
The soil batches were incubated under aerobic conditions in the dark at 20°C for a testing period of 120 days. The evaporated amount of water was determined and replenished. The characteristics of the soils (textural analysis according to USDA) are given in Table 7.1.1.1- 1. Determinations of the microbial biomass were carried out at the beginning and at the end of the test. Samples were taken for analysis at day 0, 1, 3, 7, 14, 30, 63, 90 and 120 post-treatment.
Soils were extracted immediately after sampling by shaking with acetonitrile/water (80/20). The extraction solvent contained 1 g/L cysteine hydrochloride as protecting agent for the active ingredient to prevent oxidative degradation. The radioactivity was determined in all samples and the extracts analysed by TLC and HPLC methods. JAU 6476 and its degradation products have been identified by co-chromatography with reference standards using three TLC methods. Volatile radioactivity was trapped using polyurethane plugs and soda lime. The radioactivity (i.e. $^{14}CO_2$) absorbed by the soda lime was liberated with HCl. $^{14}CO_2$ was identified by its Grignard-reaction with phenylmagnesium bromide to benzoic acid.

Table 7.1.1.1- 1: Soils used to investigate degradation and metabolism of JAU 6476 under aerobic conditions

Origin	[redacted] Rhineland/Germany	Stanley Kansas/USA
Soil type	sandy loam	silty clay loam
Textural analysis (USDA): 2000 - 50 µm, sand (%) 50 - 2 µm, silt (%) < 2 µm, clay (%)	 72.4 22.6 5.0	 12.4 48.0 39.6
pH value: Water $CaCl_2$ KCl	 7.2 6.6 6.4	 5.9 5.9 not determined
Organic C (%)	2.0	1.66
Organic matter (%) [factor: 1.72]	3.5	2.86
Microbial carbon (mg/kg dry weight of soil) Day 0 (without a.s.) Day 120 (with a.s. / without a.s.)	 460 46.5 / 44	 774 286.5 / 278
Cation exchange capacity (meq/100 g)	8	18.3
Particle density (g/mL)	2.5	2.43
1/3 bar moisture (g water for 100 g dry soil) Max. water holding capacity (g/100 g DM)	29.10 34.42	34.02 56.25

Findings:

The total recoveries of the applied radioactivity ranged from 90.9 to 99.7% in soil [redacted], and from 92.4 to 97.6% in soil Stanley during the test period of 120 days.

The amount of radioactivity bound to soil increased during the test period and reached a maximum of 40.5% at day 14 and 30 and decreased at the end of the test period to 35.6% (soil [redacted]). The amount of radioactivity bound to soil Stanley reached a maximum of 46.2% at day 120 (values expressed in percent of applied radioactivity).

In the course of the study the amounts of radioactivity which could be extracted decreased and accounted for 57.3% ([redacted]) and for 44.9% (Stanley) after 120 days.

The results concerning the recovery of radioactivity are summarised in Table 7.1.1.1- 2.

The calculations summarised in this table were performed using the computer software Microsoft Excel 97. The results given are values rounded to one digit place. Rounding errors may occur if recalculations are made using the rounded values.

Table 7.1.1.1- 2: Radioactivity balance of JAU 6476 after application to [redacted] and Stanley soil (in percent of the applied radioactivity)

Soil	Days after appl.	Soil			Volatiles		Material balance
		Extracted[a)]	Bound[b)]	Total soil	$^{14}CO_2$	Other volatiles	
[redacted]	0	89.0	10.7	99.7	n.m.	n.m.	99.7
	1	62.0	28.6	90.6	0.4	< 0.1	90.9
	3	62.3	31.2	93.4	1.0	< 0.1	94.5
	7	61.6	33.6	95.2	2.4	< 0.1	97.6
	14	55.4	40.5	95.9	2.7	0.1	98.7
	30	52.8	40.5	93.3	3.7	< 0.1	97.0
	63	52.8	40.3	93.3	5.3	< 0.1	98.6
	90	51.0	39.6	90.6	5.9	< 0.1	96.4
	120	57.3	35.6	92.9	4.1	0.1	97.0
Stanley	0	86.6	10.9	97.6	n.m.	n.m.	97.6
	1	64.6	30.7	95.3	< 0.1	< 0.1	95.3
	3	52.8	39.5	92.3	0.1	< 0.1	92.4
	7	51.8	43.2	95.0	0.6	0.1	95.7
	14	47.2	44.8	92.0	1.9	< 0.1	93.9
	30	55.0	39.4	90.4	3.8	< 0.1	94.2
	63	48.3	43.7	91.9	4.9	0.1	96.0
	90	46.3	43.3	89.6	5.3	< 0.1	94.9
	120	44.9	46.2	91.1	5.5	< 0.1	96.6

a) = extracted: organic cold extract + organic hot extract
b) = not extracted: soil + filter

In soil JAU 6476 was rapidly degradable under aerobic conditions. The test substance was metabolised via four different pathways (Figure 7.1.1-1, page 11) and partly mineralised to $^{14}CO_2$ (4.1 and 5.5% in 120 days). Five metabolites were detected in the soil extracts alone with the parent compound and $^{14}CO_2$. The metabolite JAU 6476-desthio *(M04)* accounted for a maximum of 12.3% of the applied radioactivity at day 120 (soil [redacted]) and for 10.9% at day 7 (soil Stanley, respectively. This metabolite has to be considered as major metabolite. The metabolite JAU 6476-S-methyl *(M01)* was found above 5% AR at two sequential sampling points (soil Stanley, day 3 and day 7). Based on the change of trigger values in new regulation EC no. 1107/2009 this metabolite has now also to be regarded as major metabolite. No further metabolite was present at levels higher than 5% at the end of the study. The results concerning the distribution of the active ingredient and the degradation products are summarised in Table 7.1.1.1- 3.

[1] Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC
Official Journal of the European Union L 309, 24.11.2009

Table 7.1.1.1- 3: Distribution of the active ingredient and degradation products after application of JAU 6476 to two soils and incubation at 20°C under aerobic conditions (in percent of the applied radioactivity)

Soil	Days after appl.	a.s.	M01	M02	M03	M04	M14/ M15/ M16	Other (a)
[redacted]	0	82.1	< 0.1	n.d.	< 0.1	4.1	n.d.	2.8
	1	15.2	3.8	n.d.	< 0.1	38.6	n.d.	4.3
	3	10.6	3.2	1.2	1.2	41.3	1.2	3.7
	7	7.7	2.9	2.1	1.3	39.0	2.2	5.4
	14	5.2	2.4	1.9	1.1	36.0	2.7	6.2
	30	4.4	2.2	2.2	0.7	32.5	2.1	4.6
	63	2.5	1.9	3.1	1.9	26.6	2.0	5.0
	90	2.4	1.9	3.0	2.0	35.3	2.1	4.4
	120	3.1	1.7	3.0	1.7	42.3	1.4	4.2
Stanley	0	81.9	0.3	1.1	0.1	2.8	n.d.	1.6
	1	38.8	2.4	n.d.	0.3	15.0	n.d.	7.0
	3	23.2	3.2	n.d.	2.7	19.1	n.d.	4.9
	7	15.5	5.5	1.3	1.1	22.9	1.3	6.2
	14	11.7	4.0	2.2	1.1	18.7	1.1	7.8
	30	12.6	3.3	3.1	1.1	19.7	1.9	6.5
	63	10.1	2.2	3.9	3.1	19.9	2.6	6.4
	90	9.6	1.7	4.0	2.7	19.9	2.6	5.8
	120	10.5	1.5	3.8	2.4	18.5	2.2	6.0

n.d. = not detected
a) = origin + minor metabolites / diffuse radioactivity

a.s. = JAU 6476
M01 = JAU 6476-S-methyl
M02 = JAU 6476-sulfonic acid
M03 = JAU 6476-triazolinone
M04 = JAU 6476-desthio
M14/M15/M16 = mixture of JAU 6476-3-hydroxy-desthio, JAU 6476-4-hydroxy-desthio and JAU 6476-5-hydroxy-desthio

Report:	**KCA 7.1.1.1 /02; [redacted], E.; 2001**
Title:	Proazolthion (proposed) [JAU6476]: Degradation and metabolism of JAU6476 in aerobic soils
Report No:	MR-104/01
Document No:	M-061584-01-1
Guidelines:	- U. S. Environmental Protection Agency (U.S. EPA). 1982. Pesticide Assessment Guidelines, Subdivision N, Chemistry: Environmental Fate, Section 162-1, Aerobic Soil Metabolism Studies. U.S. EPA, [redacted] - U. S. Environmental Protection Agency (U.S. EPA). Pesticide Assessment Guidelines, Subdivision N, Chemistry: Environmental Fate, Section 162-1, Aerobic Soil Metabolism Studies. U.S. EPA, [redacted] Addendum 5 on Data Reporting, by S[redacted], 1988, PB88-161187. [redacted] Hazard Evaluation Procedure Aerobic Soil Metabolism Studies, EPA 540/9-85 015, June 85. Environmental Fate Rejection Rate Analysis, U.S. EPA Draft, 1992 - Environmental Chemistry and Fate, Guidelines for Registration of Pesticides in Canada, 1987, Biotransformation in Soil – Aerobic Study, PMRA DACO 8.2.3.4 - BBA: Guidelines for the Official Testing of Plant Protectants, Part IV, 4-1: Fate of Plant Protectants in Soil – Degradation, Transformation and Metabolism (12/86) - EC: Official Journal of the European Communities, No L 172 (EN), July 22, 95. Commission Directive 95/36/EC, Amending Council Directive 91/414/EEC Concerning the Placing of Plant Protection Products on the Market: Annexes II + III, Fate and Behaviour in the Environment 7172/VI/94-EN - SETAC: Procedures for Assessing the Environmental Fate and Ecotoxicity of Pesticides, March 1985
GLP:	Yes

Test System: The aerobic soil metabolism of JAU 6476 was investigated in two soils ([redacted], a silt loam and Byromville, a loamy sand) for a maximum of 365 days under aerobic conditions in the dark at 20°C, using the phenyl- and the triazole-radiolabelled active substance. Either the phenyl- or triazole-labelled JAU 6476 was applied at the rate of about 0.26 mg a.s./kg soil, equivalent to 600 g a.s./ha in 6 inches (15.2 cm) depth of soil (according to US EPA calculation) and to 200 g a.s./ha in 5 cm depth soil (according to EU calculation). The experiment was conducted in compliance with the GLP standards, and in accordance with EC/BBA/SETAC guidelines for the soil [redacted], and in accordance with US EPA guidelines Subdivision N, Section 162-1, for the soil Byromville. The soil moisture corresponded to 50% of maximum water holding capacity in case of soil [redacted] and to 75% of 1/3 bare moisture in case of the soil Byromville, respectively. The characteristics of the soils (textural analysis according to USDA) are given in Table 7.1.1.1- 4. Determinations of the microbial biomass were carried out at the beginning of the experiment, after 120 days and at study termination (1 year).

The soil samples were treated directly as it would happen during a spray application. The application was performed by dosing aliquots of 500 µL of the phenyl- and 479 µL of the triazole-labelled JAU 6476 as small droplets onto the soil contained in the vessels by an Eppendorf pipette. Considering the amount of water present in the application solutions, the anticipated soil moisture of 50% of WHCmax for soil [redacted] as well as 75% of 1/3 bar moisture for soil Byromville was adjusted.

The test system consisted of Erlenmeyer flasks attached with traps for collection of CO_2 and volatile organics. Entire flasks were processed and investigated at day 0, 1, 2, 3, 7, 14, 30, 63, 90, 120, 181, 272 and 365.

The 100 g soil samples were extracted three times at room temperature with each 80 mL of acetonitrile/water (80:20, v:v) stabilised by addition of 1 mg cysteine¬hydrochloride / mL, and once under reflux conditions for one hour. The JAU 6476 residues were analysed by normal phase radio-

thin-layer chromatography. For identification of the transformation products co-chromatography, LC/MS and LC/MS/MS methods were used.
Volatile organic compounds possibly contained in the PU foam plugs were extracted by 25 mL of acetonitrile. Each three 0.5 mL-aliquots were radioassayed by LSC. A chromatographic analysis of the PU foam extract was not performed, because it contained less than 0.1% of the applied radioactivity, always.
The radioactivity (i.e. $^{14}CO_2$) absorbed by the soda lime was liberated with HCl and purged into LSC cocktails with nitrogen.

Table 7.1.1.1- 4: Soils used to investigate degradation and metabolism of JAU 6476 under aerobic conditions

Origin	[redacted] Rhinelam/Germany	Byromville Georgia/USA
Soil type	Silt	Loamy sand
Textural analysis (USDA):		
2000 - 50 µm, sand (%)	8.5	88.8
50 - 2 µm, silt (%)	81.3	7.6
< 2 µm, clay (%)	10.2	5.6
pH value:		
Water	7.1	6.8
$CaCl_2$	6.8	6.1
KCl	6.6	6.0
Organic C (%)	2.14	0.79
Organic matter (%) [factor: 1.724]	3.69	1.36
Soil Biomass or microbial activity (mg C microbial / kg dry weight)		
Initial (without a.s. / with a.s.)	1,400 / 3,432	23 / 25
After 120 days (without a.s. / with a.s.)	569 / 575	31 / 43
Final, after 365 days (without a.s. / with a.s.)	556	< 20
Cation exchange capacity (meq/100 g)	15	4.3
Field moisture capacity at 0.33 bar (%)	35.56	4.8
WHC_{max} (%)	63.1	Not determined
Bulk density (disturbed) (g/cm³)	2.09	1.59

Findings:
During the study the total recovery of the applied radioactivity in individual test vessels of the [redacted] soil ranged from 102.0% to 90.2% and the mean was 96.0%. In the Byromville soil the total recovery of radioactivity ranged from 102.0% to 93.2%, and the mean was 96.3%. The complete material balance found at all sampling intervals demonstrated that no significant radioactivity dissipated from the vessels or was lost during processing.
In the course of the study the amount of radioactivity which could be extracted decreased. The minimum portions of extracted radioactivity (only in case Byromville soil, triazole-label not found at day 365) yielded 25.0% (phenyl-label) and 33.4% (triazole-label) of the applied radioactivity for the [redacted] soil and 47.8% (phenyl-label) and 31.6% (triazole-label, day 181) for the Byromville soil.
The amount of radioactivity bound to soil increased during the test period and, for the [redacted] soil, reached maximum values of 47.3% (phenyl-label, day 365) and 56.4% (triazole-label, day 365), and for the Byromville soil 41.4% (phenyl-label, day 181) and 44.7% (triazole-label, day 181) as percent of applied radioactivity.
In all the test series, an increase of the portion of $^{14}CO_2$ was observed during the entire study period. Generally, the [redacted] soil indicated a significantly higher capacity for mineralisation both radiolabels to $^{14}CO_2$. At the termination of the experiment the amount of $^{14}CO_2$ yielded 17.9% for the phenyl-labelled and 5.3% for the triazole-labelled compound. In Byromville soil the formation of $^{14}CO_2$ was weak using triazole-labelled JAU 6476, finally reaching 0.7% of the applied radioactivity. Using the

phenyl-labelled JAU 6476, the portion of $^{14}CO_2$ exceeded 6.1% of the applied radioactivity at day 365. Obviously, the phenyl-label was much susceptible for mineralisation than the triazole-label.
At all sampling intervals, no volatile organic compounds were measured (each value was < 0.1% of the applied radioactivity).
The distribution of the radioactivity in the two soils is summarised in Table 7.1.1.1- 5 and Table 7.1.1.1-6. The calculations summarised in the tables were performed using the computer software MS Excel 97. The results given are values rounded to one digit place. Rounding errors may occur if recalculations are made using the rounded values.

Table 7.1.1.1- 5: Radioactivity balance of JAU 6476 after application to [redacted] soil (in percent of applied radioactivity)

Label	Days after appl.	Soil			Volatiles		Material balance
		Extracted[a)]	Bound[b)]	Total soil	$^{14}CO_2$	Other volatiles	
Phenyl	0	95.8	7.0	102.8			102.8
	1	68.4	28.2	96.6	0.2	< 0.1	96.8
	3	66.3	30.8	97.3	0.8	< 0.1	98.0
	7	63.8	28.4	92.2	1.5	< 0.1	93.7
	14	61.4	30.5	91.9	2.5	< 0.1	94.4
	30	58.4	32.5	90.9	3.1	< 0.1	94.0
	63	52.7	37.4	90.5	3.6	< 0.1	94.1
	90	48.2	37.0	85.2	6.5	< 0.1	91.8
	120	39.8	42.0	81.8	10.7	< 0.1	92.5
	181	32.3	45.2	77.5	14.0	< 0.1	91.5
	271	28.2	46.5	74.7	15.9	< 0.1	90.6
	365	25.0	47.8	72.8	17.9	< 0.1	90.2
Triazole	0	94.8	7.5	102.3			102.3
	1	68.8	30.3	99.0	< 0.1	< 0.1	99.0
	3	69.2	31.3	100.5	0.1	< 0.1	100.6
	7	67.2	32.0	99.2	< 0.1	< 0.1	99.2
	14	65.9	32.5	98.4	0.1	< 0.1	98.4
	30	63.9	34.7	98.6	0.2	< 0.1	98.6
	63	57.1	40.2	97.3	0.7	< 0.1	98.0
	90	52.7	42.7	95.4	1.1	< 0.1	95.5
	120	46.7	48.3	95.0	2.0	< 0.1	97.0
	181	40.1	52.7	92.8	2.9	< 0.1	95.7
	272	34.1	51.3	89.4	4.9	< 0.1	94.2
	365	33.4	56.4	89.8	5.3	< 0.1	95.1
					Mean over both labels:		*96.0*

a) = extracted: organic cold extract + organic hot extract
b) = not extracted: soil + filter

Table 7.1.1.1- 6: Radioactivity balance of JAU 6476 after application to Byromville soil (in percent of applied radioactivity)

Label	Days after appl.	Soil			Volatiles		Material balance
		Extracted[a)]	Bound[b)]	Total soil	$^{14}CO_2$	Other volatiles	
Phenyl	0	98.7	2.7	101.4			101.4
	1	74.3	20.6	94.9		< 0.1	95.1
	3	63.1	29.7	92.8	0.2	< 0.1	93.1
	7	59.4	36.0	95.4	0.3	< 0.1	95.8
	14	58.8	35.2	94.0	0.4	< 0.1	94.4
	30	56.4	38.1	94.4	0.8	< 0.1	95.1
	63	55.2	36.1	94.3	2.0	< 0.1	96.4
	90	58.3	36.9	95.2	0.4	< 0.1	95.7
	120	49.9	40.1	90.0	3.0	< 0.1	93.0
	181	49.1	41.4	90.5	3.1	< 0.1	93.6
	272	50.6	40.2	90.8	4.3	< 0.1	95.1
	365	47.9	38.2	86.1	6.1	< 0.1	92.2
Triazole	0	98.9	3.1	102.0			102.0
	1	93.3	23.1	98.4	0.1	< 0.1	98.5
	3	66.3	32.6	98.9	< 0.1	< 0.1	98.9
	7	60.1	34.4	94.4	< 0.1	< 0.1	94.4
	14	62.5	37.6	100.1	0.1	< 0.1	100.2
	30	58.6	38.3	96.9	0.1	< 0.1	96.9
	63	56.5	42.1	98.6	0.1	< 0.1	98.8
	90	55.2	40.5	95.7	0.2	< 0.1	95.9
	120	56.7	42.8	95.3	0.3	< 0.1	95.5
	181	51.6	44.7	96.3	0.4	< 0.1	96.7
	272	51.8	42.5	94.2	0.5	< 0.1	94.7
	365	54.1	42.8	96.9	0.7	< 0.1	97.7
						Mean over both labels:	*96.3*

a) = extracted: organic acid extract + organic hot extract
b) = not extracted: soil + filter

JAU 6476 was very rapidly degradable on both soils under aerobic conditions. In the course of the experiment, several ^{14}C regions were detected and quantified together with unaltered JAU 6476 and material remaining at the origin of the TLC separation. However, only two major degradation products occurred, i.e. amounted to ≥ 10% of the applied radioactivity at any time during the study.

The predominant metabolite was identified as JAU 6476-desthio *(M04)*, with a maximum of 46.5% and 49.4% of the applied radioactivity on day 7 in [redacted] soil (phenyl-label and triazole-label, respectively). The corresponding maximum values for the Byromville soil were 41.2% and 38.4% of the applied radioactivity on day 90 (phenyl-label and triazole-label, respectively).

The second major metabolite was JAU 6476-hydroxymethyl *(M01)*, with maximum values of 11.3% (phenyl-label) and 12.8% (triazole-label) on day 1 in [redacted] soil. The corresponding maximum values for the Byromville soil were 13.7% (phenyl-label) and 14.6% (triazole-label) on day 7.

One degradation product identified as JAU 6476 sulfonic acid (M02), was found above the limit of quantitation (LOQ) in three of the four test series, especially in the later sampling intervals. Usually, it amounted to less than 4% of the applied radioactivity (except one sample with 8.3% in the [redacted] soil at day 181, triazole-label) and did not show any trend for an increase.

Minor (trace) metabolites were identified or characterised as JAU 6476-triazolinone *(M03)*, 1,2,4-triazole *(M13)*, JAU 6476-3-hydroxy-desthio *(M14)*, JAU 6476-6-hydroxy-desthio *(M17)* and 2-chlorobenzoic acid *(M20)*. Usually, the total radioactivity not assigned to defined ^{14}C regions was < 5% (except one individual sample with 6.1%).

The results for the distribution of the active substance and the degradation products are summarised in Table 7.1.1.1- 7 and Table 7.1.1.1- 8.

Comparing the analytical results received from the test series with the different radiolabels it was shown that there is not any relevant difference related to product formation in the soil extracts. The predominant portion of degradation products contained both the phenyl and the triazole ring. Further, the profile of products found within this study indicates that the cleavage of JAU 6476 molecule, forming other degradation products, *e.g.* containing just the 1-chlorocyclopropyl-moiety, does not occur to a relevant extent. Thus, the proposed pathway of degradation of JAU 6476 is dominated by reactions at the sulphur of the triazole ring. The proposed metabolic pathway of JAU 6476 is shown in Figure 7.1.1-1, page 11.

The study demonstrated that JAU 6476 is very rapidly degraded in aerobic soil. The formed major metabolites are further degraded and, therefore, do not accumulate in soil.

Table 7.1.1.1- 7: Distribution of JAU 6476 and its metabolites after application to the soil [redacted] (in percent of applied radioactivity)

Label	Days after appl.	a.s.	M01[a)]	M02[a)]	M03[a)]	M04[a)]	M13[b)]	M14[b)]	M17[b)]	M20[b)]	Unknown meta-bolites [c,d)]
Phenyl	0	73.4	< 2.0	n.d.	n.d.	15.9		n.d.	n.d.	n.d.	< 2.0
	1	7.9	11.3	n.d.	n.d.	39.8		< 2.0	< 2.0	n.d.	2.2
	3	6.1	10.7	n.d.	< 2.0	38.6		< 2.0	< 2.0	n.d.	2.3
	7	2.0	10.3	n.d.	n.d.	46.5		< 2.0	< 2.0	n.d.	< 2.0
	14	4.2	8.4	n.d.	n.d.	35.8		< 2.0	3.1	n.d.	2.7
	30	2.9	7.5	n.d.	< 2.0	35.2		< 2.0	3.4	n.d.	2.9
	63	2.2	6.4	n.d.	n.d.	35.0		< 2.0	3.2	n.d.	2.5
	90	< 2.0	6.6	< 2.0	n.d.	33.8		n.d.	2.2	n.d.	< 2.0
	120	< 2.0	6.0	3.2	< 2.0	17.5		< 2.0	4.2	< 2.0	n.d.
	181	< 2.0	4.9	3.7	n.d.	16.8		n.d.	2.0	n.d.	n.d.
	272	< 2.0	2.6	3.1	< 2.0	8.8		< 2.0	2.9	< 2.0	< 2.0
	365	< 2.0	2.8	3.1	< 2.0	6.3		< 2.0	2.9	< 2.0	< 2.0
Triazole	0	81.0	< 2.0	n.d.	n.d.	10.2	n.d.	n.d.	n.d.	n.d.	< 2.0
	1	8.0	12.8	n.d.	n.d.	38.8	n.d.	< 2.0	< 2.0	n.d.	< 2.0
	3	6.7	11.8	n.d.	< 2.0	49.4	n.d.	< 2.0	< 2.0	n.d.	2.5
	7	< 2.0	10.7	n.d.	n.d.	49.4	n.d.	n.d.	< 2.0	n.d.	< 2.0
	14	4.6	10.3	n.d.	n.d.	39.5	n.d.	2.1	2.4	n.d.	2.7
	30	3.1	9.0	< 2.0	< 2.0	37.7	n.d.	< 2.0	3.3	n.d.	3.0
	63	< 2.0	7.4	< 2.0	n.d.	35.9	n.d.	< 2.0	3.3	n.d.	3.3
	90	< 2.0	6.3	2.4	n.d.	34.8	n.d.	n.d.	2.1	n.d.	3.0
	120	5.6	6.4	3.3	< 2.0	15.1	< 2.0	< 2.0	4.6	< 2.0	n.d.
	181	< 2.0	5.2	8.3	n.d.	16.6	n.d.	n.d.	2.4	n.d.	< 2.0
	272	6.6	3.1	3.5	n.d.	7.9	< 2.0	< 2.0	2.6	2.2	< 2.0
	365	5.9	3.1	3.3	< 2.0	6.1	n.d.	n.d.	2.3	< 2.0	< 2.0

a.s. = JAU 6476
M01 = JAU 6476-S-methyl
M02 = JAU 6476-sulfonic acid
M03 = JAU 6476-triazolinone
M04 = JAU 6476-desthio
M13 = 1,2,4-triazole
M14 = JAU 6476-3-hydroxy-desthio
M17 = JAU 6476-6-hydroxy-desthio
M20 = 2-chlorobenzoic acid

a) = identified
b) = characterised
c) = phenyl-label: sum of three unknown metabolites, none did exceed 3% of the applied radioactivity
d) = triazole-label: sum of three unknown metabolites, none did exceed 3.5% of the applied radioactivity
n.d. = not detected

Table 7.1.1.1- 8: Distribution of JAU 6476 and its metabolites after application to the soil Byromville (in percent of applied radioactivity)

Label	Days after appl.	a.s.	M01[a)]	M02[a)]	M03[a)]	M04[a)]	M13[b)]	M14[b)]	M17[b)]	M20[b)]	Unknown / metabolites
Phenyl	0	89.9	< 2.0	n.d.	n.d.	7.5		n.d.	n.d.	n.d.	n.d.
	1	46.3	6.6	n.d.	n.d.	14.3		n.d.	n.d.	n.d.	< 2.0
	3	20.5	11.3	n.d.	< 2.0	21.6		n.d.	n.d.	n.d.	< 2.0
	7	8.5	13.7	n.d.	n.d.	31.7		n.d.	n.d.	n.d.	< 2.0
	14	8.2	12.9	n.d.	< 2.0	27.8		n.d.	n.d.	n.d.	< 2.0
	30	5.2	12.3	n.d.	< 2.0	28.3		n.d.	n.d.	n.d.	< 2.0
	63	4.3	11.7	n.d.	< 2.0	32.6		n.d.	n.d.	n.d.	< 2.0
	90	4.8	8.3	n.d.	< 2.0	41.2		n.d.	n.d.	n.d.	< 2.0
	120	2.5	9.8	< 2.0	< 2.0	33.9		< 2.0	< 2.0	< 2.0	< 2.0
	181	2.4	9.2	< 2.0	< 2.0	29.5		n.d.	< 2.0	n.d.	< 2.0
	272	4.1	7.0	< 2.0	< 2.0	23.5		< 2.0	< 2.0	< 2.0	< 2.0
	365	2.3	7.1	< 2.0	< 2.0	21.9		< 2.0	< 2.0	< 2.0	< 2.0
Triazole	0	95.5	n.d.	n.d.	n.d.	2.4	n.d.	n.d.	n.d.	n.d.	n.d.
	1	52.1	6.4	n.d.	n.d.	11.7	n.d.	n.d.	n.d.	n.d.	< 2.0
	3	24.6	12.4	n.d.	< 2.0	22.9	n.d.	n.d.	n.d.	n.d.	< 2.0
	7	8.4	14.6	n.d.	< 2.0	31.7	n.d.	n.d.	n.d.	n.d.	< 2.0
	14	9.2	13.4	n.d.	< 2.0	29.9	n.d.	n.d.	n.d.	n.d.	< 2.0
	30	5.1	13.2	n.d.	< 2.0	30.4	n.d.	n.d.	n.d.	n.d.	< 2.0
	63	3.4	13.2	n.d.	< 2.0	34.0	n.d.	n.d.	n.d.	n.d.	< 2.0
	90	2.6	11.1	n.d.	< 2.0	38.4	n.d.	n.d.	n.d.	n.d.	< 2.0
	120	2.3	10.8	< 2.0	< 2.0	25.1	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
	181	2.3	10.2	< 2.0	< 2.0	29	n.d.	n.d.	< 2.0	n.d.	< 2.0
	272	3.8	7.2	2.4	< 2.0	22.2	n.d.	< 2.0	< 2.0	< 2.0	< 2.0
	365	4.6	7.6	< 2.3	< 2.0	23.7	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

a.s. = JAU 6476
M01 = JAU 6476-S-methyl
M02 = JAU 6476-sulfonic acid
M03 = JAU 6476-triazolinone
M04 = JAU 6476-desthio
M13 = 1,2,4-triazol
M14 = JAU 6476-hydroxy-desthio
M17 = JAU 6476-hydroxy-desthio
M20 = 2-chlorobenzoic acid

a) = identified
b) = characterised
c) = sum of two unknown metabolites, both < 2% of the applied radioactivity
n.d = not detected

CA 7.1.1.2 Anaerobic degradation

Due to the proposed use pattern of prothioconazole as a fungicide applied to cereals and rape, an anaerobic soil degradation study was not considered to be required. Therefore no studies on the route and rate of degradation of prothioconazole in soil under anaerobic conditions were submitted for the Annex I inclusion. However, an anaerobic soil metabolism and degradation study of prothioconazole was performed in 2014 and is submitted within this Supplemental Dossier for the prothioconazole renewal approval ([redacted] and [redacted], 2014, KCA 7.1.1.2 /01 & KCA 7.1.2.1.3 /01).

New study submitted for Annex I renewal
Justification for including this study in the Annex I Renewal Dossier: This study was conducted to cover metabolism and degradation of prothioconazole in soil under anaerobic conditions.

Report:	**KCA 7.1.1.2 /01; [redacted], O.; [redacted], D.; 2014**
Title:	[Phenyl-UL-14C]prothioconazole: anaerobic degradation / metabolism in one soil
Report No:	EnSa-13-0675
Document No:	M-494101-01-1
Guidelines:	- OECD Test Guideline No. 307 - Commission Regulation (EU) No 283/2013 in accordance with Regulation (EC) No 1107/2009 - US EPA OCSPP Test Guideline No. 835.4100 / 835.4200 with additional NAFTA requirements
GLP:	Yes
Justification:	New data

Executive Summary
The route and rate of degradation of phenyl-labelled prothioconazole were studied in one soil at 20.3°C in the dark in the laboratory under anaerobic conditions for 120 days following an aerobic incubation phase of 6 hours (total study duration of 120 days).

Table 7.1.1.2- 1: Selected soil

Soil	Source	Texture (USDA)	pH	OC [%]
[redacted]	[redacted] Germany	silt loam	6.2	2.0

a) = pH value derived from aqueous 0.01 M $CaCl_2$ suspension

A study application rate of 533 µg/kg soil dry weight was applied based on a maximum single field application rate of prothioconazole of 200 g/ha.
The test was performed in static systems consisting of Erlenmeyer flasks each containing 100 g soil (dry weight equivalents). The samples for the aerobic incubation phase and the first anaerobic sampling interval were equipped with traps (permeable for oxygen) for the collection of carbon dioxide and volatile organic compounds. During the anaerobic incubation phase, air-tight gas sampling bags were connected to the test vessels for the collection of volatiles.
After application of the test item, the test systems were incubated under aerobic conditions in the dark at 55% of the maximum water holding capacity for 6 hours. Then, the soil of each test system was flooded with oxygen-depleted water, mimicking a field flooding scenario, and set under an atmosphere of nitrogen to achieve anaerobic conditions.
Duplicate samples were processed and analysed 0 and 0.25 days after treatment (DAT) during the aerobic incubation phase and at DAT-0.25, -3, -7, -14, -30, -59, -90 and -120 for the anaerobic incubation phase. The sampling intervals of the anaerobic incubation phase correspond to 0, 3, 7, 14, 30, 59, 90 and 120 days after soil flooding (DASF).

The mean material balance was 98.3% AR (range from 95.8 to 100.4% AR).

The maximum amount of carbon dioxide formed at the end of the aerobic incubation phase was ≤ 0.1% AR and remained at the same level during the anaerobic incubation phase. Formation of volatile organic compounds during the aerobic and anaerobic incubation phase was insignificant as demonstrated by values of ≤ 0.1% AR at all sampling intervals.

Extractable residues decreased from DAT 0 from 93.1 to 57.9% AR at DASF-30 and slightly increased to 59.4% AR at DASF 120.

Non-extractable residues (NER) increased during the aerobic incubation phase from DAT 0 to DAT 0.25 from 7.3 to 25.5% AR. During the following anaerobic incubation phase, NER further increased from 27.4 to 40.2% AR at DASF 59 and slightly declined to 38.1% AR until DASF 120.

Within the aerobic incubation phase, the amount of prothioconazole decreased from DAT 0 to DAT 0.25 from 91.3 to 55.2% AR. During the following anaerobic incubation phase, the amount of prothioconazole further decreased to 3.0% AR at DASF 120.
Two degradation products were identified with the following maximum occurrences: JAU 6476-S-methyl *M01)* with 33.7% AR (anaerobic, DASF 120) and 4.6% AR (aerobic, DAT 0.25) and JAU 6476-desthio *(M04)* with 23.5% AR (anaerobic, DASF 3) and 12.6% AR (aerobic, DAT 0.25).

The total unidentified residues amounted to a maximum of 1.5% AR and no single component exceeded 1.5% AR at any sampling interval.

The experimental data could be well described by a double first order in parallel (DFOP) kinetic model. The half-life of prothioconazole under anaerobic conditions was 2.8 days in soil [redacted] am Hohenseh.

Table 7.1.1.2- 2: Degradation kinetics of prothioconazole in soil under anaerobic conditions

Soil (Texture (USDA))	Best fit Kinetic model	DT_{50} [days]	DT_{90} [days]	Chi^2 Error [%]	Visual assessment[a)]
[redacted] (Silt loam)	DFOP[b)]	2.8	55.4	9.3	+

a) visual assessment: + = good
b) DFOP: double first order in parallel

It is concluded that prothioconazole and its degradation products have no potential for accumulation in the environment.

I. MATERIALS AND METHODS

A. MATERIALS

1. Test Item

phenyl-labelled prothioconazole

Sample-ID:	KML 9656
Specific Activity:	4.75 MBq/mg (128.4 µCi/mg)
Radiochemical Purity:	97.2%
Chemical Purity:	> 98%

2. Test Soil

One soil was used (see Table 7.1.1.2- 3), which was sampled freshly from the field and sieved to a particle size of ≤ 2 mm.

Table 7.1.1.2- 3: Physico-chemical properties of test soil

Parameter			Results / Units
Soil designation			[redacted]
Geographic location			
City			[redacted]
State			North Rhine-Westphalia
Country			Germany
Soil taxonomic classification (USDA)			Loamy-skeletal, mixed, semiactive, mesic, dystric Eutrudept
Soil series			no information available
Textural class (USDA[a])			silt loam
Sand	[50 µm – 2 mm]		18%
Silt	[2 µm – 50 µm]		66%
Clay	[< 2 µm]		16%
pH	(soil/0.01 M $CaCl_2$ 1/2)		6.2
	(soil/water 1/1)		6.4
	(saturated paste)		6.4
	(soil/1 N KCl 1/1)		5.8
Organic carbon (combustion)			2.0%
Organic matter [b]			3.4%
Cation exchange capacity			11.4 meq/100 g
Water holding capacity	maximum (MWHC)		51.9 g H_2O *ad* 100 g DW
	at 1/10 bar (pF 2.0)		31.9%
Bulk density (disturbed)			1.10 g/cm³
Soil microbial biomass during the anaerobic incubation phase			[mg microbial carbon per kg soil DW]
DAT-0	untreated samples		906
DAT-0	treated samples[c]		1325
Microbial viability during the anaerobic incubation phase			[CFU/g soil DW]
DASF-120	dilution 10^{-1}	untreated	not countable
		treated[c]	not countable
	dilution 10^{-2}	untreated	not countable
		treated[c]	not countable
	dilution 10^{-3}	untreated	1.77×10^4
		treated[c]	1.73×10^4
	dilution 10^{-4}	untreated	4.33×10^4
		treated[c]	1.33×10^4
	dilution 10^{-5}	untreated	3.30×10^4
		treated[c]	1.00×10^5

a) USDA: United States Department of Agriculture
b) % organic matter = % organic carbon x 1.724
c) samples were applied with solvent of application solution (400 µL acetonitrile/water 25/75 (*v/v*)
CFU: colony forming units
DAT: days after treatment, DASF: days after soil flooding
DW: dry weight

B. STUDY DESIGN

1. Experimental Conditions

In the static test system for degradation in soil under aerobic and anaerobic conditions Erlenmeyer glass flasks (*e.g.* 300 mL) were used as test vessels. The test systems of the aerobic incubation phase and the first anaerobic sampling interval were fitted with a trap attachment (permeable for oxygen) containing soda lime for absorption of carbon dioxide and a polyurethane (PU) foam plug for adsorption of volatile organic compounds (VOC).

For the anaerobic incubation phase the test vessels were closed by sealable two-valve glass stoppers

connected with gas sampling bags for the collection of volatiles. Additionally, the test systems were placed into an inert gas flooded box in the climatic chamber.

For preparation of the test systems, 100 g dry weight equivalents of the sieved soil were weighed into each test vessel. Soil moisture was adjusted to 55% of the maximum water holding capacity (MWHC) for the individual test systems by addition of de-ionized water. The untreated test systems were equilibrated to study conditions for 4 days prior to application.
After the aerobic incubation phase of 0.25 days (6 hours), the soil of each remaining test vessel was flooded with 150 mL of oxygen-depleted, de-ionized water. To finally remove the residual oxygen from the test systems they were flushed with argon. Afterwards, the test vessels were each closed by a valve connected to an air-tight gas sampling bag (except for DASF-0 samples). The valves were set to connect the test vessel headspace and gas sampling bag, but closing the test system from the outer atmosphere. To ensure maintenance of fully oxygen-free conditions, the test systems were placed in a nitrogen flooded box within a walk-in incubation chamber.

The study application rate (SAR) was approximately 533 µg per kg soil dry weight, resulting in a SAR of 132.9 µg/mL phenyl-labelled prothioconazole per test system. 400 µL of the application solution were applied dropwise onto the soil surface of the respective equilibrated test systems using a pipette.

After application of the test item, the test systems were incubated under aerobic conditions in the dark at 55% of the maximum water holding capacity for 6 hours. Then, the soil of each test system was flooded with oxygen-depleted water, mimicking a field flooding scenario, and set under an atmosphere of nitrogen to achieve anaerobic conditions.

2. Sampling

Two sampling intervals were distributed over the entire aerobic incubation phase of 0.25 days. Eight sampling intervals were distributed over the entire anaerobic incubation phase of 120 days.
Duplicate samples were processed and analysed 0 and 0.25 days after treatment (DAT) during the aerobic incubation phase and at DAT-0.25, -3, -7, -14, -30, -59, -90 and -120 for the anaerobic incubation phase. The sampling intervals of the anaerobic incubation phase correspond to 0, 3, 7, 14, 30, 59, 90 and 120 days after soil flooding (DASF).
Microbial soil biomass was determined at start of the aerobic incubation phase. Additionally, microbial viability of the soil was determined at end of the anaerobic incubation phase (DASF-120 ≙ DAT-120).

3. Analytical Procedures

At each sampling interval of the aerobic incubation phase, the soil was extracted three times at ambient temperature using acetonitrile / water (4/1, v/v). Furthermore, two microwave extraction steps were performed using acetonitrile / water (4/1, v/v) at 70°C and methanol at 50°C.
At each sampling interval of the anaerobic incubation phase (DASF-0 onwards), soil and water were separated by decantation to allow for separate analysis of the water. Afterwards, the soil was extracted as described for the aerobic incubation phase.
The amounts of test item and degradation products in soil extracts and water were determined by liquid scintillation counting (LSC) and by HPLC radiodetection analysis. The amounts of volatiles and non-extractable residues (NER) were determined by LSC and combustion/LSC, respectively. Test item and degradation products were identified by HPLC-MS(/MS) including accurate mass determination and/or by co-chromatography.

The data for the test item of the anaerobic study phase were evaluated according to the FOCUS guidance document on degradation kinetics[1] using the software KinGUI 2. Model input datasets were the residual

[1] FOCUS (2006): "Guidance Document on Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration"
Report of the FOCUS Work Group on Degradation Kinetics, EC Document Reference Sanco/10058/2005 version 2.0, 434 pp.

amounts of test item found in each replicate test system at each sampling interval of the anaerobic incubation period.

For the determination of the degradation kinetics the following procedures were applied:

- Values between LOD and LOQ were set to the measured values.
- All single values < LOD or not detected (n.d.) were set to 0.5 x LOD. If they became < LOD / n.d. for a second time the curve was cut off until a subsequent value > LOQ occurs.

II. RESULTS AND DISCUSSION

A. EXTRACTION AND QUANTIFICATION OF RADIOACTIVITY IN SOIL SAMPLES

Table 7.1.1.2- 4 summarises the total extraction of soil samples and the quantitation of identified compounds.

Table 7.1.1.2- 4: Biotransformation of phenyl-labelled prothioconazole in silt loam under anaerobic conditions (expressed as percentage of applied radioactivity (AR))

Compound	DAT DASF	Sampling intervals 0	 0.25 N/A	 0.25 0	 3 3	 7 7	 14 14	 30 30	 59 59	 90 90	 120 120
prothioconazole		91.3	55.2	45.5	22.2	22.1	14.9	7.9	4.9	3.3	3.0
JAU 6476-S-methyl *(M01)*		n.d.	4.6	6.1	16.5	19.0	23.5	28.5	32.0	33.0	33.7
JAU 6476-desthio *(M04)*		1.8	12.6	16.1	23.5	22.2	21.2	19.6	18.5	18.8	20.4
Unidentified radioactivity[a)]		n.d.	< LOD	< LOD	1.2	1.5	< LOD	1.4	1.5	< LOD	1.3
Total extracted radioactivity[b)]		93.1	72.4	67.7	63.4	64.7	60.3	57.2	56.9	55.8	58.4
CO_2 (sum aerobic and anaerobic)[c)]		n.a.	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
volatile organics (sum aerobic and anaerobic)[c)]		n.a.	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Non-extractable residues[c)]		7.3	25.5	27.4	33.0	35.4	38.0	39.8	40.2	39.9	38.1
Total recovery[c)]		100.4	97.9	95.0	96.5	100.1	98.2	97.0	97.0	95.7	96.5

N/A: not applicable, n.d.: not detected, n.a.: not analysed, DAT: days after treatment, DASF: days after soil flooding
a) minor degradates are summed up to sum unidentified/diffuse residues
b) difference to material balance values due to rounding errors as well as clean up and chromatographic losses
c) values taken from material balance

B. MATERIAL BALANCE

The mean material balance was 98.3% AR (range from 95.8 to 100.4%AR).

The complete material balances found at all sampling intervals demonstrated that there was no significant loss of radioactivity from the test systems or during sample processing.

Table 7.1.1.2- 5: Material balance of radioactivity in soil samples (expressed as percentage of applied radioactivity (AR))

	Soil [redacted] am Hohenseh 4a
Minimum [%]	95.8
Maximum [%]	100.4
Mean [%]	98.3
Rel. standard deviation [%]	1.3

C. EXTRACTABLE AND NON-EXTRACTABLE RESIDUES

In the aerobic phase, extractable ^{14}C-residues in soil decreased from 93.1.8% at day 0 to 72.4% by day 0.25. Non-extractable (bound) residues in the soil increased from 7.3% at day 0 to 25.5% at day 0.25.
In the anaerobic phase, ^{14}C-residues decreased from 67.7% AR at day 0 to 58.4% at day 120. Non-extractable residues increased from 27.4% AR at day 0 to 38.1% at day 120.

D. VOLATILES

At the end of the aerobic phase, < 0.1% AR was present as CO_2 and also as organic volatile compounds. Also at the end of the anaerobic phase, < 0.1% AR was present as CO_2 and organic volatile compounds, respectively.

E. TRANSFORMATION AND DEGRADATION OF PARENT COMPOUND

The concentration of prothioconazole in the soil decreased from 91.3% AR at day 0 to 55.2% at day 0.25 of the aerobic phase. During the aerobic phase the metabolites JAU 6476-S-methyl *(M01)* JAU 6476-desthio *(M04)* increased from 'not detected' at day 0 to 4.6% AR at day 0.25 and from 1.8% AR to 12.6%, respectively.
During the anaerobic phase, the concentration of prothioconazole decreased from 45.5% AR at day 0 to 3.0% at day 120. Two major transformation products were detected during the anaerobic phase of the study. They are JAU 6476-S-methyl *(M01)* JAU 6476-desthio *(M04)*. JAU 6476-S-methyl increased from 6.1% AR at day 0 to 33.7 by the end of the study. The other major metabolite JAU 6476-desthio increased to 16.1% at day 0 to 20.4% by the end of the study.

Based on the results of the study, the following pathway for the degradation of phenyl-labelled prothioconazole in soil under anaerobic conditions following an aerobic incubation period is proposed (see Figure 7.1.1.2- 1), with the following possible processes involved:

- methylation of the sulfur-atom to JAU 6476-S-methyl *(M01)*;
- elimination of the sulfur-atom of prothioconazole and the S-methyl-group of JAU 6476-S-methyl to result in JAU 6476-desthio *(M04)*;
- formation of non-extractable residues.

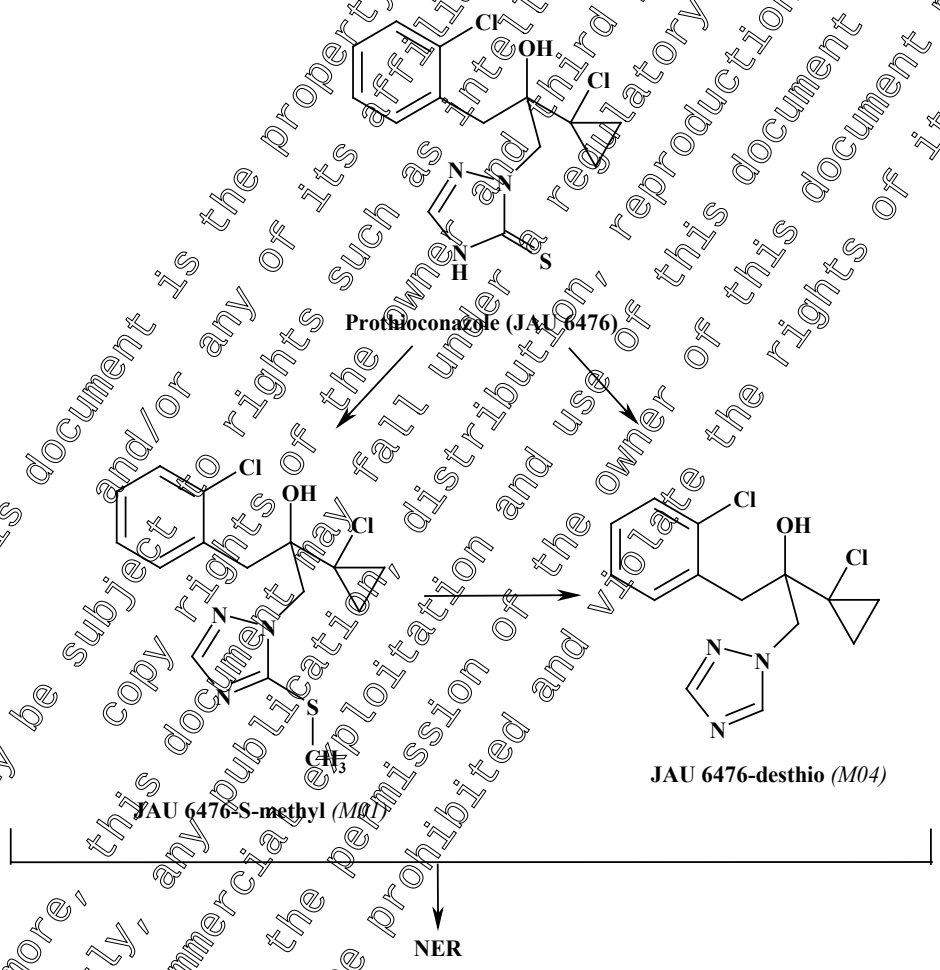
The degradation of prothioconazole followed double first order in parallel (DFOP) kinetics based on Chi^2 error values and visual assessments of fits. A summary of all kinetic data is given in Table 7.1.1.2-6. The half-live for prothioconazole was 2.8 days in the tested soil under anaerobic conditions.

Table 7.1.1.2- 6: Summary of the kinetic evaluation (for trigger values according to FOCUS) of the degradation of prothioconazole in soil under anaerobic conditions

Soil (Texture (USDA))	Kinetic model[a,b)]	DT_{50} [days]	DT_{90} [days]	Chi^2 error [%]	Visual assessment[c)]
[redacted] am Hohenseh 4a (silt loam)	SFO	8.8	29.4	24.3	o
	FOMC	4.3	92.9	11.8	+
	DFOP	**2.8**	**55.4**	**9.3**	+

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) best fits highlighted in **bold** letters
c) visual Assessment: + = good, o = moderate, - = poor

Figure 7.1.1.2- 1: Proposed metabolic pathway of phenyl-labelled prothioconazole in soil under anaerobic conditions



III. CONCLUSIONS

Prothioconazole was rapidly degraded in soil under anaerobic conditions following a short aerobic incubation phase in the dark in the laboratory.
The calculated best fit half-live was 2.8 days.
Two degradation products were identified with the following maximum occurrences: JAU 6476-S-methyl *(M01)* with 33.7% AR and JAU 6476-desthio *(M04)* with 23.5% AR.
Formation of NER was up to 40.2% AR, which is an indication for biotic degradation of prothioconazole.

Prothioconazole will be rapidly degraded in soil under anaerobic conditions following an aerobic incubation phase. Formation of significant amounts of non-extractable residues indicates a participation of prothioconazole in the natural carbon cycle of soil. Therefore, prothioconazole and its degradation products are not expected to have a potential for accumulation in the environment.

The results are included in the summary of the route of degradation of prothioconazole in soil given in section CA 7.1.1 and Figure 7.1.1-1.

CA 7.1.1.3 Soil photolysis

The route of degradation of prothioconazole in soil under photolytic conditions in the laboratory was evaluated during the Annex I inclusion using the phenyl-label, and was accepted by the European Commission (EFSA Scientific Report (2007) 106, 1-98, 12 July 2007). The following study is included in the Baseline Dossier:

Annex Point / Reference No	Author(s)	Year	Document No
KCA 7.1.1.3 /01	[redacted]	2001, rev. 2002	M-064263-02-1

For a better understanding the corresponding summary of this study as given in the Baseline Dossier is also repeated below (grey coloured).
No additional studies are submitted within this Supplemental Dossier for the prothioconazole renewal of approval. However, updated kinetic evaluations of the soil photolysis of prothioconazole and its soil metabolite JAU 6476-desthio *(M04)* under laboratory conditions have been performed according to EFSA Guidance 2014 and FOCUS Guidance 2014. The kinetic evaluation is summarised in KCA 7.1.1.3 /02.
A summary of the route of degradation of prothioconazole in soil is given in section CA 7.1.1 and Figure 7.1.1-1.

Report:	**KCA 7.1.1.3 /01; [redacted], M.; 2001, amended 2002**
Title:	Photolysis of JAU6476 on soil surface
Report No:	MR-242/00
Document No:	M-064263-02-1
Guidelines:	- U. S. Environmental Protection Agency (U.S. EPA). 1982. Pesticide Assessment Guidelines, Subdivision N, Chemistry: Environmental Fate, Section 161 3, Photodegradation Studies on Soil. U.S. EPA, [redacted] - U. S. Environmental Protection Agency (U.S. EPA). 1989. Pesticide Assessment Guidelines, Subdivision N, Chemistry: Environmental Fate, Section 161 3, Acceptance Criteria for Photodegradation Studies on Soil. U.S. EPA, [redacted] - U. S. Environmental Protection Agency (U.S. EPA). 1985. Pesticide Assessment Guidelines, Subdivision N, Chemistry: Environmental Fate, Section 161 3, Standard Evaluation Procedure for Soil Photolysis Studies, U.S. EPA, [redacted] - U. S. Environmental Protection Agency (U.S. EPA). 1989. Pesticide Assessment Guidelines, Subdivision N, Chemistry: Environmental Fate, Section 161 3, Study Compliance Checklist for Photodegradation Studies on Soil. U.S. EPA, [redacted] - U. S. Environmental Protection Agency (U.S. EPA). 1993. Pesticide Reregistration Rejection Rate Analysis - Environmental Fate, EPA 738 R 93 0110, U.S. EPA, [redacted] - U. S. Environmental Protection Agency (U.S. EPA). 1995. Pesticide Reregistration Rejection Rate Analysis - Environmental Fate, Follow-up guidance for submission of raw data EPA 738 R 95 011, U.S. EPA, [redacted] - Commission Directive 95/36/EC of 14 July 1995 amending Council Directive 91/414/EEC concerning the placing of plant protection products on the market, Official Journal of the European Communities No. L 172, 22/07/1995 - SETAC-Europe: Procedures for Assessing the Environmental Fate and Ecotoxicity of Pesticides, March 1995
GLP:	Yes

Test System: The photodegradation of phenyl-labelled JAU 6476 was studied on soil layers of the loamy sand soil Byromville ([redacted]/USA, 86.8% sand, 7.6% silt; 5.6% clay; 0.79% organic carbon; pH in water: 6.8), which was also used in an aerobic soil metabolism study. The dose rate was 4 µg a.s./3 g of soil (dry matter), corresponding to 200 g a.s./ha (calculated for a soil density of 1.5 g/cm³ and 1 cm depth), which is the recommended maximum single application rate. The water content of the samples was adjusted to 75% of 1/3 bar moisture of the soil.

The individual samples were continuously exposed to simulated sunlight (Xenon lamp) at 20°C in duplicate and processed at zero-time, after 0.5 and 4 hours and after 1, 3, 7 and 15 days. Control samples were kept in the dark and processed after one day and 7 and 15 days.

Findings:
During the study, the total recovery in the irradiated samples ranged from 93.7% to 104.7%, and the mean was 98.3%. In the course of the study, the amounts of radioactivity which could be extracted decreased, reaching 70.4% of the applied radioactivity for the irradiated samples and 62.6% for the dark control. The amount of radioactivity bound to soil increased during the test period, and reached maximum values of 25.5% at day 15 for the irradiated samples and 36.5% at day 7 for the dark control, as percent of the applied radioactivity.

During the irradiation period an amount equivalent to 0.7% of the applied radioactivity was degraded to CO_2. Seven degradation products (including CO_2) were observed along with the parent compound. Three of them were identified. JAU 6476-desthio *(M04)* was found as the only major one, reaching the maximum values of 38.5% at day 7 for the irradiated samples and 29.4% at day 15 for the dark control. The two other metabolites (JAU 6476-sulfonic acid *(M02)* and JAU 6476-triazolinone *(M03)*) accounted for far less than 4% of the applied radioactivity in the irradiated and dark control samples. Three minor unknown degradation products were observed, none of them reached 3.5% of the applied radioactivity. The results concerning the recovery of the radioactivity and the distribution of the active substances and the degradation products are summarised in Table 7.1.1.3- 1. The calculations of these results were performed using the software Microsoft Excel 97. The results given are values rounded to one digit place. Rounding errors may occur if recalculations are made using the rounded values.

Table 7.1.1.3- 1: Recovery of radioactivity and distribution of the active ingredient and metabolites after application of JAU 6476 to thin soil layers of loamy sand under artificial light conditions and in the dark (in percent of the applied radioactivity) (mean of two values)

Conditions	Exposure time (days)	a.s.	M02	M03	M04	Unknown metabolites[a)]	$^{14}CO_2$	Org. volatiles	Extracted	Not extracted	Total
Irradiated	0	75.0	< 1.0	n.d.	3.8	n.d.		n.m.	85.2	8.4	93.7
	0.06	56.2	< 1.0	< 1.0	20.6	n.d.	< 0.1	< 0.1	86.7	16.9	103.7
	0.17	50.1	1.1	1.1	25.0	n.d.	0.1	< 0.1	85.6	19.1	104.7
	1	35.8	1.3	1.7	31.3	< 1.0	< 0.1	< 0.1	77.5	22.0	99.6
	3	28.9	2.4	1.9	34.1	1.5	0.1	< 0.1	76.3	22.6	99.0
	7	19.9	2.6	2.5	38.5	3.1	0.5	0.1	73.4	23.9	97.9
	15	18.6	3.0	2.4	38.0	3.3	0.7	0.1	70.4	25.5	96.7
										Mean:	*99.3*
Dark	0							n.m.	85.2	8.4	93.7
	1	39.0	< 1.0	1.6	21.6	n.d.	< 0.1	n.m.	74.5	26.4	100.9
	7	21.4	< 1.0	2.1	25.4	1.1	0.1	< 0.1	61.7	36.5	98.3
	15	19.0	< 1.0	3.2	29.4	n.d.	< 0.1	n.m.	62.6	35.7	98.3
										Mean:	*97.8*

n.d. = not detected
n.m. = not measured
a) =sum of three unknown metabolites, none did exceed 3.1% of the applied radioactivity

a.s. = JAU 6476
M02 = JAU 6476-sulfonic acid
M03 = JAU 6476-triazolinone
M04 = JAU 6476-desthio

The data within this study demonstrate JAU 6476 to be degraded rapidly on soil surfaces if irradiated by simulated sunlight. However, comparison to dark controls, in which degradation was observed as fast as with light exposed samples, revealed photolysis not to be the dominant process of degradation. This result was supported further by comparison of the identity and quantity of degradation products extracted from both types of samples yielding JAU 6476-desthio *(M04)* as the only major metabolite and exhibiting a similar pattern of minor products each below 4% of the applied radioactivity.

Furthermore, the study demonstrated that JAU 6476 is not expected to be degraded to any major products not known from soil metabolism studies, if deposited on soil surfaces and exposed to sunlight.

New kinetic evaluation submitted for Annex I Renewal

Justification for including this study in the Annex I Renewal Dossier: The objective of this study is a kinetic evaluation of the soil photolysis of prothioconazole and its metabolites JAU 6476-desthio *(M04)* (KCA 7.1.1.3 /01, included in the Baseline Dossier). The evaluation was conducted to derive kinetic parameters according to EFSA Guidance 2014 and FOCUS Guidance 2014.

Report:	**KCA 7.1.1.3 /02; [redacted], A.C.; [redacted], C.; 2015**
Title:	Prothioconzole (PTZ) kinetics soil photolysis - Kinetic evaluation of the soil photolysis of prothioconazole and its soil metabolite desthio under laboratory conditions
Report No:	EnSa-15-0231
Document No:	M-531332-01-1
Guidelines:	- EFSA, 2014: Guidance Document for evaluating laboratory and field dissipation studies to obtain DegT50 values of active substances of plant protection products and transformation products of these active substances in soil, European Food Safety Authority (EFSA), [redacted], Italy, EFSA Journal 2014;12(5):3662 - FOCUS, 2014: Generic guidance for Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration, Version: 1.1; Date: 18 December 2014
GLP:	No (calculation)
Justification:	New data / guideline requirement: Kinetic analysis of the soil photolysis of prothioconazole and its soil metabolite JAU 6476-desthio *(M04)* under laboratory conditions

Executive Summary

The purpose of this study was to estimate normalised (20°C, pF2) degradation times (DT_{50}) to estimate endpoints (modelling and trigger endpoints). The degradation of prothioconazole in agricultural soils under laboratory light conditions was investigated in one study (KCA 7.1.1.3 /01, included in the Baseline Dossier). The present report comprises the evaluation of the data according to the most recent FOCUS Kinetics report (FOCUS, 2014). Degradation parameters were fitted with the software KinGUI 2.1.

Four kinetic models, Single First-Order (SFO) and the bi-exponential models FOMC (First-Order Multi-Compartment model), DFOP (double first order parallel) and HS (Hockey-stick) are assumed to adequately describe the degradation of the applied substance in laboratory trials (FOCUS, 2014 and EFSA, 2014).

The DT_{50} value (trigger endpoint) for prothioconazole is from 0.39 days. The normalised (20°C, pF2) modelling endpoint is 11.4 days. For JAU 6476-desthio *(M04)* no reliable DT_{50} could be obtained, as there was no observed degradation. The data are summarised in Table 7.1.1.3- 2.

Table 7.1.1.3- 2: Trigger and modelling endpoints of prothioconazole and its metabolite JAU 6476-desthio *(M04)*

Endpoints						
Trigger			Modelling			
Kinetic type[a)]	DT_{50} (24 h)[b)] [days]	DT_{50} (environ. days)[c)] [days]	Kinetic type[a)]	DT_{50} (24 h)[b)] [days]	$DT_{50\ norm.}$ (24 h)[b)] [days]	DT_{50} (environ. days)[c)] [days]
Prothioconazole						
FOMC	0.39	0.77	DFOP	11.39[d)]	4.4	8.8
JAU 6476-desthio *(M04)*						
SFO	no reliable fit		SFO	no reliable fit		

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) DT_{50} in experimental days (i.e. 24 h of irradiation per day)
c) DT_{50} in environmental days under summer sunlight conditions at Athens/Greece
d) slow phase DT_{50}

I. METHODS

Soil residue data from the soil photolysis study (Baseline Dossier, KCA 7.1.1.3/01) were used. The study was carried out with a loamy sand (Byromville). The study was performed in the laboratory under constant conditions (20°C, moisture if 75% of the 1/3 bar water holding capacity) under a light source. Prothioconazole was applied to the soil.

The kinetic analysis was performed according to FOCUS kinetics (2014) using the software KinGUI 2 with four different kinetic models: Single First-Order (SFO) and the bi-exponential models FOMC (First-Order Multi-Compartment model), DFOP (double first order parallel) and HS (Hockey-stick).
Calculation of DT_{50} / DT_{90} values: A half-life is defined as the time taken for 50% of substance to disappear/dissipate from a compartment following single first-order kinetics, whereas DT_{50} and DT_{90} values are not strictly connected to a first order kinetics. In this report half-lives, DT_{50} and DT_{90} values are calculated from the appropriate rate constant k as $DT_{50} = \ln(2)/k$ and $DT_{90} = \ln(10)/k$, respectively.
Normalisation of fitted DT_{50} values (modelling endpoints): Conditions like temperature and moisture are assumed to keep steady in the laboratory, but they can differ from the so called "standard" conditions as they are required for DT_{50} values as input parameter in models. Therefore, the modelling DT_{50} values were corrected to pF2 and an ambient temperature of 20°C. According to EFSA (2008), Q_{10} was set to 2.58 and T_{ref} was set to 20°C.
Calculation of "environmental day" DT_{50} values: The samples were irradiated continuously for 24 hours/day. The DT_{50} values derived in KinGUI are expressed in experimental days. In nature, the irradiation would be approximately 12 hours, so one way to express more realistic DT_{50} values is to multiply the DT_{50} values derived by KinGUI by 2.

II. RESULTS AND DISCUSSION

Trigger endpoints and modelling endpoints for prothioconazole and its metabolite JAU 6476-desthio *(M04)* were derived following the procedure described in FOCUS (2014) and EFSA (2014). For modelling endpoints additionally a normalisation to reference conditions according to FOCUS groundwater (2014) assumptions was performed.
The trigger endpoints and statistical parameters for prothioconazole and its metabolites JAU 6476-desthio *(M04)* are given in Table 7.1.1.3- 3 and the modelling endpoints and statistical parameters in Table 7.1.1.3- 4. The modelling DT_{50} was corrected to pF2 and an ambient temperature of 20°C. The calculated correction factor is given in Table 7.1.1.3- 5.

A summary of the best fits is given in Table 7.1.1.3- 2 in the Executive Summary of this report.

Table 7.1.1.3- 3: **Trigger endpoints and statistical endpoints of prothioconazole and its metabolites JAU 6476-desthio *(M04)***
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
Prothioconazole *(fit alone)*						
SFO	M_0: 59.9 k: 0.192	25.18	k: 0.005	-	3.61	12.0
SFO, M_0 fixed	k: 0.644	31.30	k: 0.006	-	1.08	3.58
FOMC	M_0: 82.1 α: 0.207 β: 0.0143	3.74	-	++	0.30	969
FOMC, M_0 fixed	α: 0.207 β: 0.0140	3.46	-	++	**0.39**	962
DFOP	M_0: 80.5 k_1: 9.693 k_2: 0.661 g: 0.541	8.15	k_1: 0.002 k_2: 0.003 g: <0.001	+	0.25	25.0
DFOP, M_0 fixed	k_1: 10.496 k_2: 0.662 g: 0.546	7.52	k_1: 0.001 k_2: 0.002 g: <0.001	+	0.22	24.3
► SFO fit is visually and statistically not acceptable and not more appropriate than FOMC. Therefore, FOMC and DFOP were fitted, both provided visually and statistically good fits, FOMC with constrained M_0 provided the best fit. ► **Conclusion**: FOMC with constrained M_0 provides best fit.						
JAU 6476-desthio *(M04)* *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	k_2: 0.0031 f_{PTZ}: 0.6613	2.30	k: 0.152 f_{PTZ}: <0.001	++	223	742
► No degradation observed, although visually acceptable, the t-test failed for the SFO fit. No reliable DT_{50} can be derived for JAU 6476-desthio. ► **Conclusion**: no reliable DT_{50} can be derived						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.1.3- 4: **<u>Modelling</u> endpoints and statistical endpoints of prothioconazole and its metabolites JAU 6476-desthio *(M04)***
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
Prothioconazole *(fit alone)*						
SFO	M_0: 59.9 k: 0.192	23.18	k: 0.005	-	3.61	12.0
SFO, M_0 fixed	k: 0.644	31.30	k: 0.006	-	1.08	3.58
FOMC	M_0: 82.1 α: 0.207 β: 0.0143	3.74	-	++	0.39	969
DFOP	M_0: 80.5 k_1: 9.693 k_2: 0.061 g: 0.541	8.15	k_1: 0.002 k_2: 0.003 g: <0.001	+	0.25 slow phase: **11.4**	25.0
► SFO fit is visually and statistically not acceptable, 10% of initially measured concentration not reached, DFOP provided a visually and statistically good fit ► **Conclusion**: DFOP provides best fit, use the slow phase DT_{50} of 11.4 days						
JAU 6476-desthio *(M04)* *(fit all together, start values for prothioconazole from DFOP fit)*						
SFO	k: 0.00314 **ff_{PTZ}: 0.7628**	2.88	k: <0.001 ff_{PTZ}: <0.001	++	22.1	73
► no degradation observed, SFO fit is visually and statistically acceptable ► **Conclusion**: do not use this trial						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.1.3- 5: **Calculated correction factor**

Soil	Temperature		Moisture			Correction factor
	Study [°C]	f_T [a)]	θ_{act} [%]	θ_{ref}[b)] [%]	f_θ	$f_T \bullet f_\theta$
Byromville	20	1	3.6	14	0.39	0.39

a) Q_{10} = 2.58
b) according to FOCUS 2014, Table 2.2 , p. 34 "gravimetric water content at 10kPa (field capacity %)"

III. CONCLUSIONS

The DT_{50} value (trigger endpoint) for prothioconazole is 0.39 days. The normalised (20°C, pF2) modelling endpoint (slow phase of DFOP) is 11.4 days.
For JAU 6476-desthio *(M04)* no reliable DT_{50} could be obtained, as there was no observed degradation.

CA 7.1.2 Rate of degradation in soil

Prothioconazole was rapidly degraded in soil under aerobic and anaerobic conditions in the laboratory as well as under field conditions. The kinetic models and DT_{50} values in soil of prothioconazole and its major degradation products used for modelling purpose and trigger evaluation (best-fit) as well as the formation fractions in soil for major degradation products are summarised in sections CA 7.1.2.1 and CA 7.1.2.2.

Modelling input values for the calculation of predicted environmental concentrations (PECs) of prothioconazole and its major degradation products in soil (PEC_{soil}), groundwater (PEC_{gw}) and surface water (PEC_{sw}) were derived from studies and kinetic evaluations (according to FOCUS (2006[1]/2014[2]) and EFSA (2014[3]) summarised in sections CA 7.1.2.1, CA 7.1.2.2.1 and CA 7.2, and are submitted within this Supplemental Dossier for the prothioconazole renewal of approval.

The DT_{50} values and maximum occurrences / formation fractions in soil and aquatic systems of prothioconazole and its major degradation products used as modelling input values for the calculation of PECs are summarised in Table 7.1.2- 1 to Table 7.1.2- 3.

Table 7.1.2- 1: DT_{50} values and maximum occurrences in soil of prothioconazole and its major degradation products used as modelling input values for calculation of PEC_{soil}

Modelling input parameter	Endpoint	Comment
prothioconazole		
DT_{50} in soil [days]	1.6	field, non-normalised, worst case
maximum occurrence in soil [%]	100	worst case
JAU 6476-S-methyl *(M01)*		
DT_{50} in soil [days]	280	laboratory, non-normalised, worst case
maximum occurrence in soil [%]	14.2	laboratory, worst case (mean of 2 labels)
JAU 6476-desthio *(M04)*		
DT_{50} in soil [days]	63.4	field, non-normalised, worst case
maximum occurrence in soil [%]	56.2	field, worst case

[1] FOCUS kinetics (2006): "Guidance Document on Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration", Report of the FOCUS Work Group on Degradation Kinetics, EC Document Reference Sanco/10058/2005 version 2.0, 434 pp.

[2] FOCUS, 2014: Generic guidance for Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration, Version: 1.1; Date: 18 December 2014

[3] EFSA, 2014: Guidance Document for evaluating laboratory and field dissipation studies to obtain DegT50 values of active substances of plant protection products and transformation products of these active substances in soil, European Food Safety Authority (EFSA), Parma, Italy, EFSA Journal 2014;12(5):3662

Table 7.1.2- 2: DT_{50} values and formation fraction / maximum occurrences in soil of prothioconazole and its major degradation products used as modelling input values for calculation of PEC_{gw}

Modelling input parameter	Endpoint	Comment
prothioconazole		
DT_{50} in soil [days]	0.90	based on field trials (normalised, median)
JAU 6476-S-methyl *(M01)*		
DT_{50} in soil [days]	46.4	based on laboratory trials (normalised, geom. mean)
Degradation formation fraction (proticonazole → JAU 6476-S-methyl *(M01)*)	0.11	based on laboratory trials
JAU 6476-desthio *(M04)*		
DT_{50} in soil [days]	24.7	based on field dissipation trials (normalised, geom. mean)
Degradation formation fraction (proticonazole → JAU 6476-desthio *(M04)*)	0.6[a)]	based on field dissipation trial analysis sum of formation from a.s. → M04 (0.49) and a.s. → M01 (0.11)

a) For groundwater modelling, which covers both parent and the two metabolites, JAU 6476-desthio *(M04)* and JAU 6476-S-methyl *(M01)*, the formation fraction of JAU 6476-desthio is taken as 0.49 from prothioconazole, to which is combined later the 0.11 prothioconazole to JAU 6476-desthio via JAU 6476-S-methyl (summing to 0.6). As a conservative assumption, the formation fraction from JAU 6476-S-methyl to JAU 6476-desthio is taken as 1.0

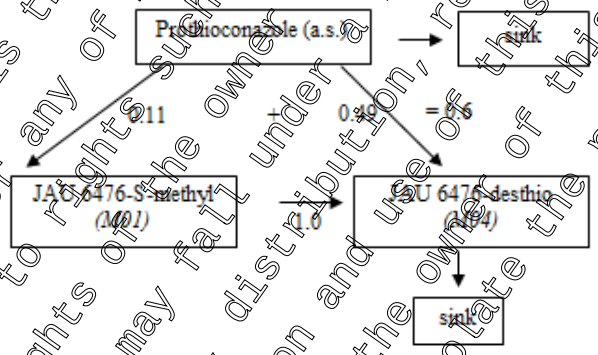


Table 7.1.2- 3: DT_{50} values and maximum occurrences in soil and aquatic systems of prothioconazole and its major degradation products used as <u>modelling input values for calculation of PEC_{sw}</u>

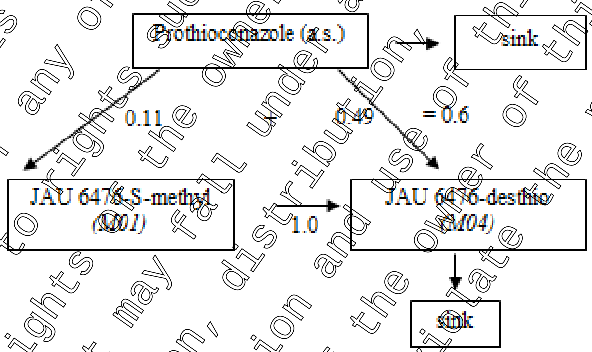
Modelling input parameter		Endpoint	Comment
prothioconazole			
DT_{50} in soil [days]	Step 1 & 2:	1.4	field, geom. mean, non-normalised
	Step 3:	0.90	field, median, normalised
DT_{50} in water [days]	Step 1 & 2:	1.2	geom. mean
	Step 3:	14.2	geom. mean (total system)
DT_{50} in sediment [days]	Step 1 & 2:	80.1	geom. mean
	Step 3:	1000	default
DT_{50} in total water-sediment [days]	Step 1 & 2:	14.2	geom. mean
max. occurrence in soil [%]		100	default
max. occurrence in water / sediment [%]		100	default
JAU 6476-S-methyl *(M01)*			
DT_{50} in soil [days]		62.6	laboratory, geom. mean, non-normalised
DT_{50} in water [days]		10.4	geom. mean
DT_{50} in sediment [days]		53.6	geom. mean
DT_{50} in total water/sediment system [days]		80.7	geom. mean
max. occurrence in soil [%]		14.2	laboratory, worst case (mean of 2 labels)
max. occurrence in water/sediment [%]		12.7	entire system
JAU 5476-desthio *(M04)*			
DT_{50} soil [days]	Step 1 & 2	39.6	field, geom. mean, non-normalised
	Step 3	24.7	field, geom. mean, normalised
DT_{50} in water [days]	Step 1 & 2:	20.0	geom. mean
	Step 3:	55.6	geom. mean (total system)
DT_{50} in sediment [days]	Step 1 & 2:	57	geom. mean
	Step 3:	1000	default
DT_{50} in total water-sediment [days]	Step 1 & 2:	55.6	geom. mean
max. occurrence in soil [%]	Step 1 & 2:	56.2	field, worst case
formation fraction soil (a.s. → M04 + a.s. → M01)	Step 3:	0.6[a)]	based on field dissipation trial analysis sum of formation from a.s. → M04 (0.49) and a.s. → M01 (0.11)
max. occurrence in water / sediment [%]	Step 1 & 2:	54.5	entire system
formation fraction water (a.s. → M04 + a.s. → M01)	Step 3:	0.638[b)]	based on total system analysis sum of formation from a.s. → M04 (0.540) and a.s. → M01 (0.098)
JAU 6476-thiazocine *(M12)*			
DT_{50} in soil [days]		1000	default
DT_{50} in water [days]		122.1	geom. mean
DT_{50} in sediment [days]		1000	default
DT_{50} in total water/sediment system [days]		1000	default
max. occurrence in soil [%]		0.0001	default
max. occurrence in aqua. photolysis [%]		15.2	% from HPLC analysis

cont.

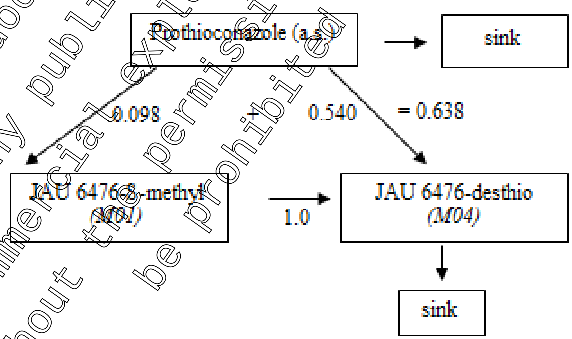
Table 7.1.2- 3 *(cont.)*: DT$_{50}$ values and maximum occurrences in soil and aquatic systems of prothioconazole and its major degradation products used as modelling input values for calculation of PEC$_{sw}$

Modelling input parameter	Endpoint	Comment
1,2,4-triazole *(M13)*		
DT$_{50}$ in soil [days]	1000	default
DT$_{50}$ in water [days]	1000	default
DT$_{50}$ in sediment [days]	1000	default
DT$_{50}$ in total water/sediment system [days]	1000	default
max. occurrence in soil [%]	0.0001	default
max. occurrence in water / sediment [%]	41.8	Angler Weiher, total system
JAU 6476-triazolylketone *(M42)*		
DT$_{50}$ in soil [days]	1000	default
DT$_{50}$ in water [days]	1000	default
DT$_{50}$ in sediment [days]	1000	default
DT$_{50}$ in total water/sediment system [days]	1000	default
max. occurrence in soil [%]	0.0001	default
max. occurrence in water / sediment [%]	9.1	Angler Weiher, total system

a) = To cover both parent and the two metabolites, JAU 6476-desthio *(M04)* and JAU 6476-S-methyl *(M01)*, the formation fraction of JAU 6476-desthio is taken as 0.49 from prothioconazole, to which is combined later the 0.11 prothioconazole to JAU 6476-desthio via JAU 6476-S-methyl (summing to 0.6). As a conservative assumption, the formation fraction from JAU 6476-S-methyl to JAU 6476-desthio is taken as 1.0



b) = To cover both parent and the two metabolites, JAU 6476-desthio *(M04)* and JAU 6476-S-methyl *(M01)*, the formation fraction of JAU 6476-desthio is taken as 0.540 from prothioconazole, to which is combined later the 0.098 prothioconazole to JAU 6476-desthio via JAU 6476-S-methyl (summing to 0.638). As a conservative assumption, the formation fraction from JAU 6476-S-methyl to JAU 6476-desthio is taken as 1.0



CA 7.1.2.1 Laboratory studies

The degradation rates of prothioconazole and its major degradation products in soil were studied using two different radiolabel positions for the parent compound (phenyl- and triazole-label) and the phenyl-label for major degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)*. The studies have been performed in a number of soils in the dark in the laboratory at a temperature of 20°C and different soil moistures.

For prothioconazole the kinetic models and DT_{50} and DT_{90} values used for trigger evaluation and the DT_{50} values for modelling purpose are summarised in Table 7.1.2.1- 1 and Table 7.1.2.1- 2, respectively. For the metabolite JAU 6476-S-methyl *(M01)* the kinetic models and DT_{50} and DT_{90} values used for trigger evaluation and the DT_{50} values for modelling (incl. formation fractions) are summarised in Table 7.1.2.1- 3 and Table 7.1.2.1- 4, respectively and for the metabolite JAU 6476-desthio *(M04)* in Table 7.1.2.1- 5 and Table 7.1.2.1- 6, respectively.

Table 7.1.2.1- 1: Summary of DT_{50} values for degradation of prothioconazole in aerobic soils for trigger evaluation purpose

Temp. [°C]	Soil	Texture (USDA)	Annex Point / Reference No	Kinetic type[a)]	DT_{50} [days]	DT_{90} [days]
20	[redacted]	sandy loam	KCA 7.1.2.1.1 /04	FOMC	0.06	4.4
	Stanley	silty clay loam	KCA 7.1.2.1.1 /04	DFOP	0.91	121
	Byromville, phenyl-label	loamy sand	KCA 7.1.2.1.1 /04	DFOP	1.00	5.2
	Byromville, triazole-label	loamy sand	KCA 7.1.2.1.1 /04	DFOP	1.21	6.4
	[redacted], phenyl-label	silt	KCA 7.1.2.1.1 /04	FOMC	0.005	0.6
	[redacted], triazole-label	silt	KCA 7.1.2.1.1 /04	FOMC	<0.001	0.15

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

Table 7.1.2.1- 2: Summary of DT_{50} values for degradation of prothioconazole in aerobic soils for modelling

Temp. [°C]	Soil	Texture (USDA)	Annex Point / Reference No	Kinetic type[a)]	DT_{50} [days] unnorm.	DT_{50} [days] norm.[b)]
20	[redacted]	sandy loam	KCA 7.1.2.1.1 /04	FOMC	1.33	1.20
	Stanley	silty clay loam	KCA 7.1.2.1.1 /04	DFOP	140.3[c)]	130.3
	Byromville, phenyl-label	loamy sand	KCA 7.1.2.1.1 /04	FOMC	2.93	1.16
	Byromville, triazole-label	loamy sand	KCA 7.1.2.1.1 /04	FOMC	2.98	1.18
	[redacted], phenyl-label	silt	KCA 7.1.2.1.1 /04	FOMC	0.19	0.22
	[redacted], triazole-label	silt	KCA 7.1.2.1.1 /04	FOMC	0.05	0.05

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) normalised to 20°C and pF2
c) DT_{50} of slow phase from DFOP fit

Table 7.1.2.1- 3: Summary of DT_{50} values for degradation of JAU 6476-S-methyl *(M01)* in aerobic soils for trigger evaluation purpose

Temp. [°C]	Soil	Texture (USDA)	Annex Point / Reference No	Kinetic type[a)]	DT_{50} [days]	DT_{90} [days]
20	[redacted]	sandy loam	KCA 7.1.2.1.2 /03	SFO	87.6	291
	Stanley	silty clay loam	KCA 7.1.2.1.2 /03	SFO	45.1	150
	Byromville, phenyl-label	loamy sand	KCA 7.1.2.1.2 /03	SFO	230.4	766
	Byromville, triazole-label	loamy sand	KCA 7.1.2.1.2 /03	SFO	275.1	914
	[redacted], phenyl-label	silt	KCA 7.1.2.1.2 /03	SFO	125.2	416
	[redacted], triazole-label	silt	KCA 7.1.2.1.2 /03	SFO	136.2	452
	[redacted] am Hohenseh	loamy silt	KCA 7.1.2.1.2 /03	FOMC	3.13	36.7
	[redacted] A III	loamy silt	KCA 7.1.2.1.2 /03	FOMC	13.7	207
	[redacted] A XXa	sandy loam	KCA 7.1.2.1.2 /03	FOMC	3.94	58.1
	Stanley	silty clay	KCA 7.1.2.1.2 /03	FOMC	26.8	429

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

Table 7.1.2.1- 4: Summary of DT_{50} values for degradation of JAU 6476-S-methyl *(M01)* in aerobic soils for modelling

Temp. [°C]	Soil	Texture (USDA)	Annex Point / Reference No	Formation fraction	Kinetic type[a)]	DT_{50} [days] unnorm.	DT_{50} [days] norm.[b)]
20	[redacted]	sandy loam	KCA 7.1.2.1.2 /03	0.04	SFO	87.6	79.5
	Stanley	silty clay loam	KCA 7.1.2.1.2 /03	0.08	SFO	45.1	41.9
	Byromville, phenyl-label	loamy sand	KCA 7.1.2.1.2 /03	0.14	SFO	279.8	111.3
	Byromville, triazole-label	loamy sand	KCA 7.1.2.1.2 /03	0.16	SFO	275.1	109.4
	[redacted], phenyl-label	silt	KCA 7.1.2.1.2 /03	0.12	SFO	125.2	143.7
	[redacted], triazole-label	silt	KCA 7.1.2.1.2 /03	0.13	SFO	136.2	156.3
	[redacted] am Hohenseh	loamy silt	KCA 7.1.2.1.2 /03	-	FOMC	11.1	10.6
	[redacted] A III	loamy silt	KCA 7.1.2.1.2 /03	-	SFO	22.6	15.1
	[redacted] A XXa	sandy loam	KCA 7.1.2.1.2 /03	-	FOMC	17.5	14.0
	Stanley	silty clay	KCA 7.1.2.1.2 /03	-	SFO	40.5	22.7

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) normalised to 20°C and pF2

Table 7.1.2.1- 5: Summary of DT_{50} values for degradation of JAU 6476-desthio *(M04)* in aerobic soils for trigger evaluation purpose

Temp. [°C]	Soil	Texture (USDA)	Annex Point / Reference No	Kinetic type[a)]	DT_{50} [days]	DT_{90} [days]
20	[redacted]	sandy loam	KCA 7.1.2.1.2 /03	SFO	fit not reliable	
	Stanley	silty clay loam	KCA 7.1.2.1.2 /03	SFO	fit not reliable	
	Byromville, phenyl-label	loamy sand	KCA 7.1.2.1.2 /03	SFO	fit not reliable	
	Byromville, triazole-label	loamy sand	KCA 7.1.2.1.2 /03	SFO	fit not reliable	
	[redacted], phenyl-label	silt	KCA 7.1.2.1.2 /03	SFO[b)]	127.7	424
	[redacted], triazole-label	silt	KCA 7.1.2.1.2 /03	SFO	100.7	334
	[redacted] am Hohenseh	loamy silt	KCA 7.1.2.1.2 /03	FOMC	10.4	714
	[redacted] A III	loamy silt	KCA 7.1.2.1.2 /03	DFOP	22.9	109
	[redacted] A XXa	sandy loam	KCA 7.1.2.1.2 /03	FOMC	5.1	36.9
	Stanley	silty clay	KCA 7.1.2.1.2 /03	FOMC	12.9	89.2

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) fitted from maximum

Table 7.1.2.1- 6: Summary of DT_{50} values for degradation of JAU 6476-desthio *(M04)* in aerobic soils for modelling

Temp. [°C]	Soil	Texture (USDA)	Annex Point / Reference No	Formation fraction	Kinetic type[a)]	DT_{50} [days] unnorm.	DT_{50} [days] norm.[b)]
20	[redacted]	sandy loam	KCA 7.1.2.1.2 /03	not reliable	SFO	fit not reliable	
	Stanley	silty clay loam	KCA 7.1.2.1.2 /03	not reliable	SFO	fit not reliable	
	Byromville, phenyl-label	loamy sand	KCA 7.1.2.1.2 /03	not reliable	SFO	fit not reliable	
	Byromville, triazole-label	loamy sand	KCA 7.1.2.1.2 /03	not reliable	SFO	fit not reliable	
	[redacted], phenyl-label	silt	KCA 7.1.2.1.2 /03	not reliable	SFO	127.7	146.5
	[redacted], triazole-label	silt	KCA 7.1.2.1.2 /03	0.51	SFO	100.7	116
	[redacted] am Hohenseh	loamy silt	KCA 7.1.2.1.2 /03		DFOP	96.4[c)]	91.9
	[redacted] A III	loamy silt	KCA 7.1.2.1.2 /03	-	SFO	27.2	18.1
	[redacted] A XXa	sandy loam	KCA 7.1.2.1.2 /03	-	FOMC	11.13	8.88
	Stanley	silty clay	KCA 7.1.2.1.2 /03	-	SFO	26.86	15.07

a) SFO: single first order, FOMC: first order multi-compartment, DFOP: double first order in parallel
b) normalised to 20°C and pF2
c) DT_{50} of slow phase from DFOP fit

CA 7.1.2.1.1 Aerobic degradation of the active substance

The degradation rate of prothioconazole in soil under aerobic conditions in the dark in the laboratory was evaluated during the Annex I inclusion using two radiolabel positions, phenyl- and triazole-label, and was accepted by the European Commission (EFSA Scientific Report (2007) 106, 1-98, 12 July 2007). Furthermore, the portions of prothioconazole degrading to the major degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* were determined. The following studies are included in the Baseline Dossier:

Annex Point / Reference No	Author(s)	Year	Document No
KCA 7.1.2.1.1 /01	[redacted], M.; [redacted], P.	2000, rev. 2001	M-023328-03-1
KCA 7.1.2.1.1 /02	[redacted], E.	2001	M-061584-01-1
KCA 7.1.2.1.1 /03	[redacted], T.	2001	M-075324-01-1

No additional studies are submitted within this Supplemental Dossier for the prothioconazole renewal of approval. However, updated kinetic evaluations of the degradation behaviour of prothioconazole in soil under aerobic conditions in the dark in the laboratory have been performed to EFSA Guidance 2014 and FOCUS Guidance 2014 to derive kinetic parameters suitable for modelling purpose and environmental risk assessment. A summary of the degradation rates of prothioconazole and its major degradation products in soil in the laboratory is given in section CA 7.1.2.1.

New kinetic evaluation submitted for Annex I Renewal

Justification for including this study in the Annex I Renewal Dossier: The objective of this study is a kinetic evaluation of the aerobic soil metabolism studies of prothioconazole (KCA 7.1.2.1.1 /01 and KCA 7.1.2.1.1 /02, included in the Baseline Dossier and its major degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* (KCA 7.1.2.1.2 /01 and KCA 7.1.2.1.2 /02, respectively, also included in the Baseline Dossier). The evaluation was conducted to derive kinetic parameters according to EFSA Guidance 2014 and FOCUS Guidance 2014.

Report:	**KCA 7.1.2.1.1 /04; [redacted], A. and [redacted], C.; 2015**
Title:	Kinetic evaluation (trigger and modelling endpoints) of the soil degradation of prothioconazole and its soil metabolites desthio and S-methyl under laboratory conditions
Report No:	EnSa-15-0223
Document No:	M-532633-01-1
Guidelines:	- EFSA, 2014: Guidance Document for evaluating laboratory and field dissipation studies to obtain DegT50 values of active substances of plant protection products and transformation products of these active substances in soil, European Food Safety Authority (EFSA), [redacted] Italy, EFSA Journal 2014;12(5):3662 - FOCUS, 2014: Generic guidance for Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration, Version: 1.1; Date: 18 December 2014
GLP:	No (calculation)
Justification:	New data / guideline requirement: Kinetic analysis of the degradation of prothioconazole and its major degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* for trigger and modelling endpoints

Executive Summary

The purpose of this study was to estimate normalised (20°C, pF2) degradation times (DT_{50}) for use in model simulations of environmental exposure (modelling endpoints) and to estimate trigger endpoints (persistence endpoints) for prothioconazole and its major degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)*. The soil degradation of prothioconazole has been investigated in laboratory degradation studies prothioconazole (KCA 7.1.2.1.1 /01 and KCA 7.1.2.1.1 /02, included in the Baseline Dossier). The present report comprises the evaluation of the data according to the most recent FOCUS Kinetics report (FOCUS, 2014). Degradation parameters were fitted with the software KinGUI 2.1.

Four kinetic models, Single First-Order (SFO) and the bi-exponential models FOMC (First-Order Multi-Compartment model), DFOP (double first order parallel) and HS (Hockey-stick) are assumed to adequately describe the degradation of the applied substance in laboratory trials (FOCUS, 2014 and EFSA, 2014).

The DT_{50} values (trigger endpoints) for prothioconazole range from < 0.001 to 1.21 days, with a geometric mean of 0.08 days. The unnormalised modelling endpoints range from 0.05 to 140.3 days. The normalised (20°C, pF2) modelling endpoints range from 0.05 to 130.3 days with a geometric mean of 1.16 days. The derived degradation rates are considered appropriate as input for modelling purposes. The data are summarised in Table 7.1.2.1.1- 1 and Table 7.1.2.1.1- 2.

The parts concerning the major degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* are reported in section CA 7.1.2.1.2 (KCA 7.1.2.1.2 /03) of this document.

Table 7.1.2.1.1- 1: Trigger endpoints of prothioconazole

Study	Annex Point / Reference No	Soil	Kinetic type[a)]	DT_{50} [days]
[redacted], M.; [redacted], P. (2000, rev. 2001)	KCA 7.1.2.1.1 /01	[redacted]	FOMC	0.06
		Stanley	DFOP	0.91
[redacted], E. (2001)	KCA 7.1.2.1.1 /02	Byromville, phenyl-label	DFOP	1.00
		Byromville, triazole-label	DFOP	1.21
		[redacted], phenyl-label	FOMC	0.005
		[redacted], triazole-label	FOMC	0.001
Arithmetic mean				**0.53**
Geometric mean				**0.08**
Maximum				**1.21**

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

Table 7.1.2.1.1- 2: Modelling endpoints of prothioconazole

Study	Annex Point / Reference No	Soil	Kinetic type[a)]	DT_{50} [days] unnorm.	DT_{50} [days] norm.[b)]
[redacted], M.; [redacted], P. (2000, rev. 2001)	KCA 7.1.2.1.1 /01	[redacted]	FOMC	1.33	1.20
		Stanley	DFOP	140.3	130.3
[redacted], E. (2001)	KCA 7.1.2.1.1 /02	Byromville, phenyl-label	FOMC	2.93	1.16
		Byromville, triazole-label	FOMC	2.98	1.18
		[redacted], phenyl-label	FOMC	0.19	0.22
		[redacted], triazole-label	FOMC	0.05	0.05
Arithmetic mean				**24.6**	**22.4**
Geometric mean				**1.56**	**1.16**
Maximum				**140.3**	**130.3**

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) normalised to 20°C and pF2

I. METHODS

Soil residue data from the aerobic soil degradation studies M-023328-03-1 and M-061584-01-1 (Baseline Dossier, KCA 7.1.2.1.1 /01 and KCA 7.1.2.1.1 /02) were used. In these studies, the degradation of prothioconazole was studied in soil [redacted] (sandy loam), soil Stanley (silty clay loam), soil Byromville (loamy sand) and soil [redacted] (silt) under aerobic conditions in the dark in the laboratory at 20°C, and a test concentrations of 200 g a.s./ha.

The kinetic analysis was performed according to FOCUS kinetics (2014) using the software KinGUI 2 with four different kinetic models: Single First-Order (SFO) and the bi-exponential models FOMC (First-Order Multi-Compartment model), DFOP (double first order parallel) and HS (Hockey-stick).
Calculation of DT_{50} / DT_{90} values: A half-life is defined as the time taken for 50% of substance to disappear/dissipate from a compartment following single first-order kinetics, whereas DT_{50} and DT_{90} values are not strictly connected to a first order kinetics. In this report half-lives, DT_{50} and DT_{90} values are calculated from the appropriate rate constant k as $DT_{50} = \ln(2)/k$ and $DT_{90} = \ln(10)/k$, respectively.
Normalisation of fitted DT_{50} values (modelling endpoints): Conditions like temperature and moisture are assumed to keept steady in the laboratory, but they can differ from the so called "standard" conditions as they are required for DT_{50} values as input parameter in models. Therefore, the modelling DT_{50} values were corrected to pF2 and an ambient temperature of 20°C. According to EFSA (2008), Q_{10} was set to 2.58 and T_{ref} was set to 20°C.

II. RESULTS AND DISCUSSION

Trigger endpoints and modelling endpoints for prothioconazole and its metabolites were derived following the procedure described in FOCUS (2014) and EFSA (2014). For modelling endpoints additionally a normalisation to reference conditions according to FOCUS groundwater (2014) assumptions was performed.

The trigger endpoints and statistical parameters for prothioconazole are given in Table 7.1.2.1.1-3. A summary of the best fits of the trigger endpoints of prothioconazole is given in Table 7.1.2.1.1-1 in the Executive Summary.

The non-normalised modelling endpoints and statistical parameters for prothioconazole are given in Table 7.1.2.1.1- 4. The modelling DT_{50} values were corrected to pF2 and an ambient temperature of 20°C. Calculated correction factors for all trials are given in Table 7.1.2.1.1- 5. A summary of the best fits non-normalised modelling endpoints and the corresponding normalised modelling endpoints are given in Table 7.1.2.1.1- 2 in the Executive Summary of this report.

Table 7.1.2.1.1- 3: Trigger endpoints and statistical endpoints of prothioconazole
(Prothioconazole fit alone)
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted], M.; [redacted], P. (2000, rev. 2001) (KCA 7.1.2.1.1 /01)						
[redacted]						
SFO	M_0: 87.7 k: 1.686	26.16	k: 0.001	-	0.411	1.365
SFO, M_0 fixed	k: 1.688	24.91	k: <0.001	-	0.411	1.364
FOMC	M_0: 87.8 α: 0.3832 β: 0.0108	2.29	-	++	0.055	4.401
FOMC, M_0 fixed	α: 0.3832 β: 0.0108	2.16	-	++	**0.055**	4.401
DFOP	M_0: 87.8 k_1: 2.5075 k_2: 0.0177 g: 0.8978	7.00	k_1: <0.001 k_2: 0.016 g: <0.001	+	0.324	2.424
DFOP , M_0 fixed	k_1: 2.5075 k_2: 0.0177 g: 0.8978	7.00	k_1: <0.001 k_2: 0.009 g: <0.001	+	0.324	2.424
► SFO fit is visually and statistically not acceptable and not more appropriate than FOMC. Therefore, FOMC and DFOP were fitted, both provided visual and statistical good fits, FOMC with constrained M_0 provided the best fit. ► **Conclusion**: FOMC with constrained M_0 provides best fit						
Stanley						
SFO	M_0: 81.23 k: 0.501	33.55	k: 0.012	-	1.38	4.60
SFO, M_0 fixed	k: 0.5574	32.31	k: <0.001	-	1.24	4.13
FOMC	M_0: 86.07 α: 0.347 β: 0.088	8.29		+	0.57	67.9
FOMC, M_0 fixed	α: 0.347 β: 0.089	7.84	-	+	0.57	68.0
DFOP	M_0: 85.58 k_1: 1.0280 k_2: 0.0049 g: 0.8174	7.71	k_1: <0.001 k_2: 0.049 g: <0.001	+	0.92	122
DFOP, M_0 fixed	k_1: 1.0350 k_2: 0.0049 g: 0.818	7.24	k_1: <0.001 k_2: 0.033 g: <0.001	+	**0.91**	121
► SFO fit is visually and statistically not acceptable and not more appropriate than FOMC. Therefore, FOMC and DFOP were fitted; both provided visually and statistically good fits, DFOP with constrained M_0 provided the best fit. ► **Conclusion**: DFOP with constrained M_0 provides best fit						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel *cont.*
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.1- 3 *(cont.):* **Trigger endpoints and statistical endpoints of prothioconazole**
(Prothioconazole fit alone)
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted] **(2001)**	(KCA 7.1.2.1.1 /02)					
Byromville (phenyl-label)						
SFO	M_0: 95.1 k: 0.603	22.83	k: <0.001	-	1.15	3.8
SFO, M_0 fixed	k: 0.623	22.22	k: <0.001	-	1.11	3.7
FOMC	M_0: 97.7 α: 0.805 β: 0.59	11.00	-	o	0.81	9.7
FOMC, M_0 fixed	α: 0.806 β: 0.59	10.58	-	o	0.81	9.8
DFOP	M_0: 96.7 k_1: 0.785 k_2: 0.006 g: 0.912	8.98	k_1: <0.001 k_2: 0.023 g: <0.001	+	1.01	5.2
DFOP, M_0 fixed	k_1: 0.794 k_2: 0.007 g: 0.912	8.66	k_1: <0.001 k_2: 0.016 g: <0.001	+	**1.00**	5.2
► SFO fit is visually and statistically not acceptable, therefore, FOMC and DFOP were fitted, both provided visual and statistical good fits, DFOP with constrained M_0 provided the best fit. ► **Conclusion**: DFOP with constrained M_0 provides best fit						
Byromville (triazole-label)						
SFO	M_0: 95.3 k: 0.499	20.67	k: <0.001	-	1.39	4.6
SFO, M_0 fixed	k: 0.519	20.21	k: <0.001	-	1.34	4.4
FOMC	M_0: 98.3 α: 0.957 β: 0.98	11.46	-	o	1.04	9.9
FOMC, M_0 fixed	α: 0.959 β: 0.99	11.03	-	o	1.05	9.9
DFOP	M_0: 96.9 k_1: 0.645 k_2: 0.009 g: 0.911	10.75	k_1: <0.001 k_2: 0.052 g: <0.001	o	1.23	6.3
DFOP, M_0 fixed	k_1: 0.661 k_2: 0.010 g: 0.907	10.37	k_1: <0.001 k_2: 0.039 g: <0.001	o	**1.21**	**6.4**
► SFO fit is visually and statistically not acceptable, therefore, FOMC and DFOP were fitted, both provided visually and statistically good fits, DFOP with constrained M_0 provided the best fit ► **Conclusion**: DFOP with constrained M_0 provides best fit						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.1- 3 *(cont.)*: Trigger endpoints and statistical endpoints of prothioconazole
(Prothioconazole fit alone)
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted] (2001)	(KCA 7.1.2.1.1 /02)					
[redacted] (phenyl-label)						
SFO	M_0: 91.7 k: 2.434	16.32	k: 0.001	-	0.28	0.9
SFO, M_0 fixed	k: 2.434	15.44	k: <0.001	-	0.28	0.9
FOMC	M_0: 91.7 α: 0.338 β: 0.00	4.97	-	+	0.005	0.6
FOMC, M_0 fixed	α: 0.338 β: 0.00	4.66	-	+	**0.005**	0.6
DFOP	M_0: 91.7 k_1: 3.240 k_2: 0.013 g: 0.950	6.14	k_1: 0.001 k_2: 0.103 g: <0.001	+	0.23	0.9
DFOP, M_0 fixed	k_1: 3.240 k_2: 0.013 g: 0.950	5.68	k_1: 0.001 k_2: 0.076 g: <0.001	+	0.23	0.9
► SFO fit is visually and statistically not acceptable, therefore, FOMC and DFOP were fitted, both provided visually and statistically good fits, FOMC with constrained M_0 provides best fit. ► **Conclusion**: FOMC with constrained M_0 provides best fit						
[redacted] (triazole-label)						
SFO	M_0: 91.2 k: 2.294	28.10	k: <0.001	-	0.30	1.00
SFO, M_0 fixed	k: 2.294	27.11	k: <0.001	-	0.30	1.00
FOMC	M_0: 91.2 α: 0.147 β: 0.00	16.11	-	o	**<0.001**	0.15
FOMC, M_0 fixed	α: 0.147 β: 0.00	15.49	-	o	<0.001	0.15
DFOP	M_0: 91.2 k_1: 2.824 k_2: 0.000 g: 0.958	14.91	k_1: <0.001 k_2: 0.50 g: <0.001	+	0.26	1.0
DFOP, M_0 fixed	k_1: 2.824 k_2: 0.000 g: 0.958	14.28	k_1: <0.001 k_2: 0.50 g: <0.001	+	0.26	1.0
► SFO fit is visually and statistically not acceptable, therefore, FOMC and DFOP were fitted, both provided visually good fits, the FOMC fit was considered acceptable. ► **Conclusion**: FOMC provides best fit						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.1- 4: Modelling endpoints and statistical endpoints of prothioconazole (non-normalised)
(Prothioconazole fit alone)
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted], M.; [redacted], P. (2000, rev. 2001) (KCA 7.1.2.1.1 /01)						
[redacted]						
SFO	M_0: 87.7 k: 1.686	26.16	k: 0.001	-	0.41	1.37
SFO, M_0 fixed	k: 1.688	24.91	k: <0.001	-	0.41	1.36
FOMC	M_0: 87.8 α: 0.3832 β: 0.0108	2.29	-	++	(0.055) **1.33**[c)]	4.40
► SFO fit is visually and statistically not acceptable, constraining M_0 does not help. As 10% of the initial concentration are reached within the experimental period, FOMC was fitted and provided a visually and statistically very good fit ► **Conclusion**: FOMC provides best fit, use DT_{50} back-calculated from DT_{90} (4.401/3.32) = 1.325						
Stanley						
SFO	M_0: 81.23 k: 0.501	33.55	k: 0.012	-	1.38	4.60
SFO, M_0 fixed	k: 0.5574	32.31	k: <0.001	-	1.24	4.13
DFOP	M_0: 85.58 k_1: 1.0280 k_2: 0.0049 g: 0.8174	7.71	k_1: <0.001 k_2: 0.049 g: <0.001	+	0.918 slow phase: **140.3**	122
► SFO fit is visually and statistically not acceptable, therefore, DFOP was fitted as the 10% of the initial concentration have not been reached within the experimental period ► **Conclusion**: DFOP provides best fit, use DT_{50} of slow phase (**140.3 d**)						
[redacted] **(2001)** (KCA 7.1.2.1.1 /02)						
Byromville (phenyl-label)						
SFO	M_0: 95.1 k: 0.603	22.83	k: <0.001	-	1.15	3.8
SFO, M_0 fixed	k: 0.623	22.22	k: <0.001	-	1.11	3.7
FOMC	M_0: 97.7 α: 0.805 β: 0.59	11.00	-	o	0.81 **2.93**[c)]	9.7
► SFO fit is visually and statistically not acceptable, 10% of the initially measured concentration was reached, therefore FOMC was fitted and provided an acceptable fit, so the back calculated DT_{50} was used. ► **Conclusion**: FOMC provides best fit, use DT_{50} back-calculated from DT_{90} (9.7/3.32) = 2.93						
Byromville (triazole-label)						
SFO	M_0: 95.3 k: 0.499	20.67	k: <0.001	-	1.39	4.6
SFO, M_0 fixed	k: 0.519	20.21	k: <0.001	-	1.34	4.4
FOMC	M_0: 98.3 α: 0.957 β: 0.98	11.46	-	o	1.04 **2.98**[c)]	9.9
► SFO fit is visually and statistically not acceptable, 10% of the initially measured concentration was reached, therefore FOMC was fitted and provided an acceptable fit, so the back-calculated DT_{50} was used ► **Conclusion**: FOMC provides best fit, use DT_{50} back-calculated from DT_{90} (9.9/3.32) = 2.98						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel *cont.*
b) visual fit: + = good, o = moderate, - = poor
c) back-calculated DT_{50} from DT_{90}

Table 7.1.2.1.1- 4 *(cont.)*: **<u>Modelling</u> endpoints and statistical endpoints of prothioconazole (non-normalised)** (Prothioconazole fit alone)
best fits highlighted in **bold letters**

Type of kinetics[a]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b]	DT_{50} [days]	DT_{90} [days]
[redacted] (2001) (KCA 7.1.2.1.1 /02)						
[redacted] (phenyl-label)						
SFO	M_0: 91.7 k: 2.434	16.32	k: 0.001	-	0.28	0.9
SFO, M_0 fixed	k: 2.434	15.44	k: <0.001	-	0.28	0.9
FOMC	M_0: 91.7 α: 0.338 β: 0.00	4.97	-	+	0.005 **0.19[c]**	0.6
► SFO fit is visually and statistically not acceptable, 10% of the initially measured concentration was reached, therefore FOMC was fitted and provided an acceptable fit, so the back-calculated DT_{50} was used. ► **Conclusion**: FOMC provides best fit, use DT_{50} back-calculated from DT_{90} (0.63/3.32) = 0.19						
[redacted] (triazole-label)						
SFO	M_0: 91.2 k: 2.294	28.10	k: <0.001	-	0.3	1.0
SFO, M_0 fixed	k: 2.294	27.11	k: <0.001	-	0.3	1.0
FOMC	M_0: 91.2 α: 0.147 β: 0.00	16.01	-	o	<0.01 **0.05[c]**	0.15
► SFO fit is visually and statistically not acceptable, 10% of the initially measured concentration was reached, therefore FOMC was fitted and provided an acceptable fit, so the back calculated DT_{50} was used. ► **Conclusion**: FOMC provides best fit, use DT_{50} back-calculated from DT_{90} (0.15/3.32) = 0.05						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor
c) back-calculated DT_{50} from DT_{90}

Table 7.1.2.1.1- 5: Calculated correction factors for all trials

Soil	Temperature Study [°C]	f_T [a]	Moisture θ_{act} [%]	θ_{ref} [b] [%]	f_θ	Correction factor $f_T \bullet f_\theta$
[redacted], M.; [redacted], P. (2000, rev. 2001) (KCA 7.1.2.1.1 /01)						
[redacted]	20	1	16.5	19	0.91	0.91
Stanley	20	1	27.0	30	0.93	0.93
[redacted] (2001) (KCA 7.1.2.1.1 /02)						
Byromville	20.3	1	3.6	14	0.39	0.39
[redacted]	20.3	1	31.6	27	1.12	1.12
[redacted] (2001) (KCA 7.1.2.1.2 /01 & KCA 7.1.2.1.2 /02)						
[redacted]	20	1	25.2	27	0.95	0.95
[redacted] A III	20	1	14.6	26	0.67	0.67
[redacted] A XXa	20	1	13.8	19	0.80	0.80
Stanley	20	1	17.5	40	0.56	0.56

a) Q_{10} = 2.58
b) according to FOCUS 2014, Table 2.2 , p. 34 "gravimetric water content at 10kPa (field capacity %)"

III. CONCLUSIONS

The DT_{50} values (trigger endpoints) for prothioconazole range from < 0.001 to 1.21 days, with a geometric mean of 0.08 days.
The unnormalised modelling endpoints range from 0.05 to 140.3 days. The normalised (20°C, pF2) modelling endpoints range from 0.05 to 130.3 days with a geometric mean of 1.16 days. The derived degradation rates are considered appropriate as input for modelling purposes.

CA 7.1.2.1.2 Aerobic degradation of metabolites, breakdown and reaction products

JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* were found as major soil metabolites in soil metabolism studies with prothioconazole under aerobic conditions. For these metabolites degradation studies have been performed in soil under aerobic conditions in the dark in laboratory were accepted by the European Commission (EFSA Scientific Report (2007) 106, 1-98, 12 July 2007). The following studies are included in the Baseline Dossier:

Annex Point / Reference No	Author(s)	Year	Document No
Prothioconazole			
KCA 7.1.2.1.1 /01	[redacted], M.; [redacted], P.	2000, rev. 2001	M-023328-03-1
KCA 7.1.2.1.1 /02	[redacted], E.	2001	M-061584-01-1
JAU 6476-S-methyl *(M01)*			
KCA 7.1.2.1.2 /01	[redacted], M.	2001	M-056651-02-1
JAU 6476-desthio *(M04)*			
KCA 7.1.2.1.2 /02	[redacted], M.	2001	M-056633-02-1

No additional studies are submitted within this Supplemental Dossier for the prothioconazole renewal of approval. However, updated kinetic evaluations of the degradation behaviour of JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* in soil under aerobic conditions in the dark in the laboratory have been performed according to FOCUS kinetics (2006) to derive kinetic parameters suitable for modelling purpose and environmental risk assessment. A summary of the degradation rates of and its major degradation products in soil in the laboratory is given in section CA 7.1.2.1.

New kinetic evaluation submitted for Annex I Renewal

Justification for including this study in the Annex I Renewal Dossier: The objective of this study is a kinetic evaluation of the aerobic soil metabolism studies of prothioconazole and its major degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)*. These studies are-included in the Baseline Dossier. The evaluation was conducted to derive kinetic parameters according to EFSA Guidance 2014 and FOCUS Guidance 2014.

Report:	**KCA 7.1.2.1.2 /03; [redacted] A. and [redacted] C.; 2015**
Title:	Kinetic evaluation (trigger and modelling endpoints) of the soil degradation of prothioconazole and its soil metabolites desthio and S-methyl under laboratory conditions
Report No:	EnSa-15-0223
Document No:	M-532633-01-1
Guidelines:	- EFSA, 2014: Guidance Document for evaluating laboratory and field dissipation studies to obtain DegT50 values of active substances of plant protection products and transformation products of these active substances in soil, European Food Safety Authority (EFSA), [redacted], Italy, EFSA Journal 2014;12(5):3662 - FOCUS, 2014: Generic guidance for Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration, Version: 1.1; Date: 18 December 2014
GLP:	No (calculation)
Justification:	New data / guideline requirement: Kinetic analysis of the degradation of prothioconazole and its major degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* for trigger and modelling endpoints

Executive Summary

The purpose of this study was to estimate normalised (20°C, pF2) degradation times (DT_{50}) for use in model simulations of environmental exposure (modelling endpoints) and to estimate trigger endpoints (persistence endpoints) for prothioconazole and its major degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)*.

The present report comprises the evaluation of the data according to the most recent FOCUS Kinetics report (FOCUS, 2014). Degradation parameters were fitted with the software KinGUI 2.1.

Four kinetic models, Single First-Order (SFO) and the bi-exponential models FOMC (First-Order Multi-Compartment model), DFOP (double first order parallel) and HS (Hockey-stick) are assumed to adequately describe the degradation of the applied substance in laboratory trials (FOCUS, 2014 and EFSA, 2014).

For <u>JAU 6476-S-methyl *(M01)*</u> the kinetic evaluations are based on soil degradation laboratory degradation studies of prothioconazole and JAU 6476-S-methyl *(M01)* which are included in the Baseline Dossier.

The DT_{50} values (trigger endpoints) for JAU 6476-S-methyl *(M01)* range from 3.1 to 275.1 days, with a geometric mean of 42.4 days. The unnormalised modelling endpoints range from 11.1 to 279.8 days. The normalised (20°C, pF2) modelling endpoints range from 10.6 to 156.3 days with a geometric mean of 46.4 days. The derived degradation rates are considered appropriate as input for modelling purposes. For JAU 6476-S-methyl it has to be mentioned, that the degradation was much slower in the studies in which the parent was applied than in the study where JAU 6476-S-methyl was applied as a pseudo-parent.

The data are summarised in Table 7.1.2.1.2- 1 and Table 7.1.2.1.2- 2.

For JAU 6476-desthio *(M04)* the kinetic evaluations are based on soil degradation laboratory degradation studies of prothioconazole and JAU 6476-desthio *(M04)* which are included in the Baseline Dossier.
The DT_{50} values (trigger endpoints) for JAU 6476-desthio *(M04)* range from 5.1 to 127.7 days with a geometric mean of 24.2 days. The unnormalised modelling endpoints range from 11.1 to 127.7 days. The normalised (20°C, pF2) modelling endpoints range from 8.9 to 146.5 days with a geometric mean of 39.4days. The data are summarised in Table 7.1.2.1.2- 3 and Table 7.1.2.1.2- 4.

The estimated formation fractions of and JAU 6476-S-methyl and JAU 6476-desthio are shown in Table 7.1.2.1.2- 5. The formation from JAU 6476-S-methyl to JAU 6476-desthio has to be interpreted with care as in the studies with prothioconazole applied as parent, the degradation of the metabolites was much slower than in those studies with applications of the metabolites as pseudo-parents. Also the correlation between the degradation rate of JAU 6476-desthio and the formation fraction of JAU 6476-desthio out of JAU 6476-S-methyl was high- another hint, that this formation fraction should not be used.

Table 7.1.2.1.2- 1: Trigger endpoints of JAU 6476-S-methyl *(M01)*

Study	Annex Point / Reference No	Soil	Kinetic type[a)]	DT_{50} [days]
[redacted], M.; [redacted], P. (2000, rev. 2001)	KCA 7.1.2.1.1 /01	[redacted]	SFO	87.6
		Stanley	SFO	45.1
[redacted], E. (2001)	KCA 7.1.2.1.1 /02	Byromville, phenyl-label	SFO	230
		Byromville, triazole-label	SFO	275
		[redacted] phenyl-label	SFO	125.2
		[redacted] triazole-label	SFO	136.2
[redacted] (2001)	KCA 7.1.2.1.2 /01	[redacted]	FOMC	3.13
		[redacted] A III	FOMC	13.7
		[redacted] A XXa	FOMC	3.9
		Stanley	FOMC	26.8
Arithmetic mean				**94.7**
Geometric mean				**42.4**
Maximum				**275**

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

Table 7.1.2.1.2- 2: Modelling endpoints of JAU 6476-S-methyl *(M01)*

Study	Annex Point / Reference No	Soil	Kinetic type[a)]	DT50 [days] unnorm.	DT50 [days] norm.[b)]
[redacted], M.; [redacted], P. (2000, rev. 2001)	KCA 7.1.2.1.1 /01	[redacted]	SFO	87.6	79.5
		Stanley	SFO	45.1	41.9
[redacted], E. (2001)	KCA 7.1.2.1.1 /02	Byromville, phenyl-label	SFO	279.8	111.3
		Byromville, triazole-label	SFO	275.1	109.4
		[redacted], phenyl-label	SFO	125.2	143.7
		[redacted], triazole-label	SFO	136.2	156.3
[redacted] (2001)	KCA 7.1.2.1.2 /01	[redacted]	FOMC	11.1	10.6
		[redacted] A III	SFO	22.6	15.1
		[redacted] A XXa	FOMC	17.5	14.0
		Stanley	SFO	40.5	22.7
Arithmetic mean				**104.1**	**70.4**
Geometric mean				**62.6**	**46.4**
Maximum				**279.8**	**156.3**

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) normalised to 20°C and pF2

Table 7.1.2.1.2- 3: Trigger endpoints of JAU 6476-desthio *(M04)*

Study	Annex Point / Reference No	Soil	Kinetic type[a)]	DT50 [days]
[redacted], M.; [redacted], P. (2000, rev. 2001)	KCA 7.1.2.1.1 /01	[redacted]	SFO	fit not reliable
		Stanley	SFO	
[redacted], E. (2001)	KCA 7.1.2.1.1 /02	Byromville, phenyl-label	SFO	fit not reliable
		Byromville, triazole-label	SFO	
		[redacted], phenyl-label	SFO[b)]	127.7
		[redacted], triazole-label	SFO	100.7
[redacted] (2001)	KCA 7.1.2.1.2 /02	[redacted]	FOMC	10.4
		[redacted] A III	DFOP	22.9
		[redacted] A XXa	FOMC	5.1
		Stanley	FOMC	12.9
Arithmetic mean				**46.6**
Geometric mean				**24.2**
Maximum				**127.7**

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) fitted from maximum

Table 7.1.2.1.2- 4: Modelling endpoints of JAU 6476-desthio *(M04)*

Study	Annex Point / Reference No	Soil	Kinetic type[a)]	DT50 [days] unnorm.	DT50 [days] norm.[b)]
[redacted], M.; [redacted], P. (2000, rev. 2001)	KCA 7.1.2.1.1 /01	[redacted]	SFO	fit not reliable	
		Stanley	SFO	fit not reliable	
[redacted], E. (2001)	KCA 7.1.2.1.1 /02	Byromville, phenyl-label	SFO	fit not reliable	
		Byromville, triazole-label	SFO	fit not reliable	
		[redacted], phenyl-label	SFO	127.7	146.5
		[redacted], triazole-label	SFO	100.7	116
[redacted] (2001)	KCA 7.1.2.1.2 /02	[redacted]	DFOP	96.4	91.9
		[redacted] A III	SFO	27.2	18.1
		[redacted] A XXa	FOMC	11.13	8.88
		Stanley	FOMC	26.86	15.07
Arithmetic mean				**65.0**	**66.0**
Geometric mean				**46.5**	**39.4**
Maximum				**127.7**	**146.5**

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) normalised to 20°C and pF2

Table 7.1.2.1.2- 5: Estimated formation fractions of the metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)*

Study Annex Point	Soil	JAU 6476-S-methyl from prothioconazole	JAU 6476-desthio from prothioconazole	JAU 6476-desthio from JAU 6476-S-methyl[a)]
[redacted], M.; [redacted], P. (2000, rev. 2001) KCA 7.1.2.1.1 /01	[redacted]	0.04	no reliable fit	no reliable fit
	Stanley	0.08	no reliable fit	no reliable fit
[redacted], E. (2001) KCA 7.1.2.1.1 /02	Byromville, phenyl-label	0.14	no reliable fit	no reliable fit
	Byromville, triazole-label	0.16	no reliable fit	no reliable fit
	[redacted], phenyl-label	0.02	no reliable fit	no reliable fit
	[redacted], triazole-label	0.13	0.51	no reliable fit
Arithmetic mean		**0.11**	**--**	**--**
Geometric mean		**0.10**	**--**	**--**
Maximum		**0.16**	**0.51**	**1.00[b)]**

a) the formation fractions from JAU6476-S-methyl *(M01)* are not reliable
b) default worst case

I. METHODS

Soil residue data from the aerobic soil degradation studies of prothioconazole (Baseline Dossier, KCA 7.1.2.1.1 /01 and KCA 7.1.2.1.1 /02) JAU 6476-S-methyl *(M01* (Baseline Dossier, KCA 7.1.2.1.2 /01) and JAU 6476-desthio *(M04)* (Baseline Dossier, KCA 7.1.2.1.2 /02) were used. In

these studies, the degradation of prothioconazole was studied in soil [redacted] (sandy loam), soil Stanley (silty clay loam), soil Byromville (loamy sand) and soil [redacted] (silt) under aerobic conditions in the dark in the laboratory at 20°C, and a test concentrations of 200 g a.s./ha. The tests for JAU 6476-S-methyl and JAU 6476-desthio in soil [redacted] (loamy silt), [redacted] AIII (loamy silt), [redacted] AXXa (sandy loam) and soil Stanley (silty clay) with a test concentration of 30 g/ha and 72.5 g/ha, respectively.

Detailed information on the kinetic analysis is given in the corresponding chapter of the parent compound in section CA 7.1.2.1.1 (KCA 7.1.2.1.1 /04).

II. RESULTS AND DISCUSSION

- **JAU 6476-S-methyl *(M01)***

The trigger endpoints and statistical parameters for JAU 6476-S-methyl *(M01)* are given in Table 7.1.2.1.2- 6. A summary of the best fits of the trigger endpoints of prothioconazole is given in Table 7.1.2.1.2- 1 in the Executive Summary.

The non-normalised modelling endpoints and statistical parameters for JAU 6476-S-methyl are given in Table 7.1.2.1.2- 7. The modelling DT_{50} values were corrected to pF2 and an ambient temperature of 20°C. Calculated correction factors for all trials are given in Table 7.1.2.1.1- 5 in the chapter of the parent compound. A summary of the best fits non-normalised modelling endpoints and the corresponding normalised modelling endpoints are given in Table 7.1.2.1.2- 2 in the Executive Summary.

Table 7.1.2.1.2- 6: Trigger endpoints and statistical endpoints of JAU 6476-S-methyl *(M01)*
based on prothioconazole studies

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted], M.; [redacted], P. (2000, rev. 2001) (KCA 7.1.2.1.1 /01)						
[redacted] *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0079	14.33	k: 0.001	+	**87.6**	291
► JAU 6476-S-methyl shows degradation, and SFO fit (with best-fit from parent) was considered acceptable. ► **Conclusion**: fit was considered visually and statistically acceptable.						
Stanley *(fit all together, start values for PTZ from DFOP fit)*						
SFO	M_0: 0 k: 0.0154	7.94	k: <0.001	+	**45.1**	150
► JAU 6476-S-methyl can be described with an SFO fit ► **Conclusion**: use SFO fit from fit with best-fit parent (DFOP)						
[redacted] **(2001)** (KCA 7.1.2.1.1 /02)						
Byromville (phenyl-label) *(fit all together, start values for prothioconazole from DFOP fit)*						
SFO	M_0: 0 k: 0.0030	8.54	k: 0.001	+	**230**	766
► JAU 6476-S-methyl shows degradation, and SFO fit (with best-fit from parent) was considered acceptable. ► **Conclusion**: visual and statistical fit are considered acceptable. DT_{50} of JAU 6476-S-methyl can be used.						
Byromville (triazole-label) *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0025	6.07	k: <0.001	+	**275**	914
► JAU 6476-S-methyl shows degradation, and SFO fit (with best-fit from parent) was considered acceptable ► **Conclusion**: visual and statistical fit are considered acceptable. DT_{50} of JAU 6476-S-methyl can be used.						
[redacted] **(phenyl-label)** *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0055	11.34	k: <0.001	+	**125.2**	416
► JAU 6476-S-methyl shows degradation, and SFO fit (with best-fit from parent) was considered acceptable ► **Conclusion**: visual and statistical fit are considered acceptable. DT_{50} of JAU 6476-S-methyl can be used.						
[redacted] **(triazole-label)** *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0051	8.74	k: <0.001	++	**136.2**	452
► JAU 6476-S-methyl shows degradation, and SFO fit (with best-fit from parent) was considered acceptable ► **Conclusion**: visual and statistical fit are considered acceptable.						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel *cont.*
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.2- 6 *(cont.):* **Trigger endpoints and statistical endpoints of JAU 6476-S-methyl *(M01)***
JAU 6476-S-methyl as parent

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted] **(2001)** (KCA 7.1.2.1.2 /01)						
[redacted] **am Hohenseh**						
SFO	M_0: 86.8 k: 0.153	16.63	k: <0.001	o	4.54	15.1
SFO, M_0 fix	k: 0.171	17.51	k: <0.001	o	4.06	13.5
FOMC	M_0: 91.4 α: 0.826 β: 2.41	2.99	-	+	3.17	36.8
FOMC, M_0 fix	α: 0.820 β: 2.36	2.90	-	+	**3.13**	36.7
DFOP	M_0: 91.2 k_1: 0.456 k_2: 0.036 g: 0.617	1.40	k_1: <0.001 k_2: 0.002 g: : <0.001	+	3.02	37.4
DFOP, M_0 fix	k_1: 0.470 k_2: 0.037 g: 0.613	1.16	k_1: <0.001 k_2: 0.001 g: : <0.001	+	2.95	36.9
► SFO fit is visually and statistically acceptable but not better than FOMC; therefore FOMC and DFOP were fitted, both describe the degradation of JAU 6476-S-methyl good, but FOMC with constrained M_0 provides best fit						
► **Conclusion**: use DT_{50} value from FOMC fit with constrained M_0						
[redacted] **A III**						
SFO	M_0: 84.5 k: 0.031	12.43	k: <0.001	+	22.62	75.1
SFO, M_0 fix	k: 0.040	15.58	k: <0.001	+	17.46	58.0
FOMC	M_0: 91.2 α: 0.703 β: 8.15	6.42	-	++	**13.69**	207
FOMC, M_0 fix	α: 0.650 β: 6.54	6.50	-	++	12.47	220
DFOP	M_0: 93.4 k_1: 0.460 k_2: 0.018 g: 0.917	5.71	M_0: <0.001 k_1: 0.029 k_2: <0.001 g: : <0.001	+	16.95	104
DFOP, M_0 fix	k_1: 0.462 k_2: 0.018 g: 0.917	5.36	k_1: 0.016 k_2: <0.001 g: : <0.001	+	16.91	104
► SFO fit is visually and statistically acceptable but not better than FOMC; therefore FOMC and DFOP were fitted, both describe the degradation of JAU 6476-S-methyl good, but FOMC provides best fit (as FOMC with M_0 free provides the worst case, this one is chosen over FOMC with fixed M_0.)						
► **Conclusion**: use DT_{50} value from FOMC fit						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel *cont.*
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.2- 6 *(cont.)*: **Trigger endpoints and statistical endpoints of JAU 6476-S-methyl *(M01)***
JAU 6476-S-methyl as parent

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted] (2001) (KCA 7.1.2.1.2 /01)						
[redacted]f AXXa						
SFO	M_0: 84.1 k: 0.112	17.62	k: <0.001	o	6.19	20.6
SFO, M_0 fix	k: 0.133	19.45	k: <0.001	o	5.22	17.3
FOMC	M_0: 90.0 α: 0.714 β: 2.40	5.99	-	++	**3.94**	58.1
FOMC, M_0 fix	α: 0.700 β: 2.25	5.85	-	++	3.80	58.0
DFOP	M_0: 90.3 k_1: 0.550 k_2: 0.034 g: 0.515	7.10	k_1: 0.006 k_2: 0.002 g: <0.001	+	3.60	45.9
DFOP, M_0 fix	k_1: 0.580 k_2: 0.035 g: 0.511	6.75	k_1: 0.003 k_2: 0.001 g: <0.001	+	3.49	45.1
► SFO fit is visually and statistically acceptable but not better than FOMC; therefore FOMC and DFOP were fitted, both describe the degradation of JAU 6476-S-methyl good - as FOMC with M_0 free provides the worst case, this one is chosen over FOMC with fixed M_0 ► **Conclusion**: use DT_{50} value from FOMC fit						
Stanley						
SFO	M_0: 82.7 k: 0.017	9.38	k: <0.001	+	40.51	135
SFO, M_0 fix	k: 0.022	14.10	k: <0.001	+	32.21	107
FOMC	M_0: 88.1 α: 0.683 β: 15.24	6.49	-	++	**26.82**	429
FOMC, M_0 fix	α: 0.551 β: 8.74	7.46	-	++	22.01	562
DFOP	M_0: 92.7 k_1: 27.56 k_2: 0.014 g: 0.191	5.65	- k_1: <0.001 k_2: <0.001 g: 0.002	+	33.49	145
DFOP, M_0 fix	k_1: 27.58 k_2: 0.014 g: 0.191	5.30	k_1: <0.001 k_2: <0.001 g: <0.001	+	33.49	145
► SFO fit is visually and statistically acceptable but not better than FOMC; therefore FOMC and DFOP were fitted, both describe the degradation of JAU 6476-S-methyl good, but FOMC provides best fit ► **Conclusion**: use DT_{50} value from FOMC fit						

a) SFO: Single first order, FOMC: First order multi compartment, DFOP: Double first order in parallel
b) Visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.2- 7: Modelling endpoints and statistical endpoints of JAU 6476-S-methyl *(M01)* (non-normalised) based on prothioconazole studies

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted], **M.;** [redacted], **P. (2000, rev. 2001)** (KCA 7.1.2.1.1 /01)						
[redacted] *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0079 ff_{PTZ}: **0.0402**	14.33	k: 0.001 ff_{PTZ}: <0.001	+	**87.6**	291
► JAU 6476-S-methyl shows degradation, and SFO fit (with best-fit from parent) was considered acceptable. ► **Conclusion**: fit was considered visually and statistically acceptable. DT_{50} and formation fraction of JAU 6476-S-methyl can be used.						
Stanley *(fit all together, start values for PTZ from DFOP fit)*						
SFO	M_0: 0 k: 0.0154 ff_{PTZ}: **0.0776**	7.94	k: <0.001 ff_{PTZ}: <0.001	+	**45.1**	150
► JAU 6476-S-methyl can be described with an SFO fit. ► **Conclusion**: use formation fraction and DT_{50} from SFO fit from fit with best-fit parent (DFOP)						
[redacted] **(2001)** (KCA 7.1.2.1.1 /02)						
Byromville (phenyl-label) *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0025 ff_{PTZ}: **0.1419**	9.23	k: <0.001 ff_{PTZ}: <0.001	+	**280**	930
► JAU 6476-S-methyl shows degradation, and SFO fit (with best-fit from parent) was considered acceptable. ► **Conclusion**: visual and statistical fit ware considered acceptable. DT_{50} and formation fraction of JAU 6476-S-methyl can be used.						
Byromville (triazole-label) *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0025 ff_{PTZ}: **0.1588**	6.07	k: <0.001 ff_{PTZ}: <0.001	+	**275**	914
► JAU 6476-S-methyl shows degradation, and SFO fit was considered acceptable, the fit with the best fit of the parent is better and therefore used here ► **Conclusion**: visual and statistical fit ware considered acceptable. DT_{50} and formation fraction of JAU 6476-S-methyl can be used.						
[redacted] **(phenyl-label)** *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0055 ff_{PTZ}: **0.1182**	11.34	k: <0.001 ff_{PTZ}: <0.001	+	**125.2**	416
► JAU 6476-S-methyl shows degradation, and SFO fit was considered acceptable, the fit with the best fit of the parent is better and therefore used here ► **Conclusion**: visual and statistical fit ware considered acceptable. DT_{50} and formation fraction of JAU 6476-S-methyl can be used.						
[redacted] **(triazole-label)** *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0051 ff_{PTZ}: **0.1321**	8.74	k: <0.001 ff_{PTZ}: <0.001	++	**136.2**	452
► JAU 6476-S-methyl shows degradation, and SFO fit was considered acceptable ► **Conclusion**: visual and statistical fit ware considered acceptable. DT_{50} and formation fraction of JAU 6476-S-methyl can be used.						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel *cont.*
b) Visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.2- 7 *(cont.)*: **Modelling endpoints and statistical endpoints of JAU 6476-S-methyl *(M01)*, (non-normalised)**
JAU 6476-S-methyl as parent

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted] (2001) (KCA 7.1.2.1.2 /01)						
[redacted] am Hohenseh						
SFO	M_0: 86.8 k: 0.153	16.63	k: <0.001	o	4.54	15.1
SFO, M_0 fix	k: 0.171	17.51	k: <0.001	o	4.06	13.5
FOMC	M_0: 91.4 α: 0.826 β: 2.41	2.99	-	+	3.17 **11.1**[c)]	36.8
► SFO fit is acceptable, but not very good, modifying does not help at all, FOMC fit is visually and statistically very good and therefore the back-calulated DT_{50} from FOMC is used as modelling endpoint ► **Conclusion**: use back-calculated DT_{50} value (DT_{90} / 3.32 = 36.8/3.32 = 11.1) from FOMC fit						
[redacted] A III						
SFO	M_0: 84.5 k: 0.031	12.43	k: <0.001	+	**22.6**	75.1
► SFO fit is visually and statistically good ► **Conclusion**: use DT_{50} value from SFO fit						
[redacted] f AXXa						
SFO	M_0: 84.1 k: 0.112	17.62	k: <0.001	o	6.19	20.6
SFO, M0 fix	k: 0.133	19.45	k: <0.001	o	5.22	17.3
FOMC	M_0: 90.0 α: 0.714 β: 2.40	5.99	-	++	3.94 **17.5**[c)]	58.1
► SFO fit is acceptable, but not very good, modifying does not help at all, FOMC fit is visually and statistically very good and therefore the back-calulated DT_{50} from FOMC is used as modelling endpoint ► **Conclusion**: use back-calculated DT_{50} value (DT_{90} / 3.32 = 58.1/3.32 = 17.5) from FOMC fit						
Stanley						
SFO	M_0: 82.7 k: 0.017	9.38	k: <0.001	o	**40.5**	134.6
► SFO fit is visually and statistically acceptable ► **Conclusion**: use DT_{50} value from SFO fit						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor
c) back calculated DT_{50} from DT_{90}

- **JAU 6476-desthio *(M04)***

The trigger endpoints and statistical parameters for JAU 6476-desthio *(M04)* are given in Table 7.1.2.1.2- 8. A summary of the best fits of the trigger endpoints of JAU 6476-desthio is given in Table 7.1.2.1.2- 3 in the Executive Summary of this report.

The non-normalised modelling endpoints and statistical parameters for JAU 6476-desthio are given in Table 7.1.2.1.2- 9. The modelling DT_{50} values were corrected to pF2 and an ambient temperature of 20°C. Calculated correction factors for all trials are given in Table 7.1.2.1.1- 5 in the chapter of the parent compound. A summary of the best fits non-normalised modelling endpoints and the corresponding normalised modelling endpoints are given in Table 7.1.2.1.2- 4 in the Executive Summary of this report.

Table 7.1.2.1.2- 8: <u>Trigger</u> endpoints and statistical endpoints of JAU 6476-desthio *(M04)*
based on prothioconazole studies

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted], M.; [redacted], P. (2000, rev. 2001) (KCA 7.1.2.1.1 /01)						
[redacted] *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0008	7.56	k: 0.464	+	922	> 1000
► JAU 6476-desthio shows nearly **no degradation**, the maximum was probably not reached within the sampling period, so further fits were not performed , fit is visually and statistically acceptable. ► **Conclusion**: no degradation, do not use this trial						
Stanley *(fit all together, start values for PTZ from DFOP fit)*						
SFO	M_0: 0 k: 0.0016	3.34	k: 0.237	+	433	> 1000
► JAU 6476-desthio shows nearly **no degradation**, the maximum was probably not reached within the sampling period, so further fits were not performed, fit is visually ok, but statistically not. ► **Conclusion**: no degradation, do not use this trial						
[redacted] **(2001)** (KCA 7.1.2.1.1 /02)						
Byromville (phenyl-label) *(fit all together, start values for prothioconazole from DFOP fit)*						
SFO	M_0: 0 k: 0.0019	14.01	k: 0.357	+	357	> 1000
► JAU 6476-desthio shows nearly **no degradation**, the maximum was probably not reached within the sampling period, fit is visually and statistically good. ► **Conclusion**: no degradation, do not use this trial						
Byromville (triazole-label) *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0019	11.05	k: 0.365	o	365	> 1000
► JAU 6476-desthio shows nearly **no degradation**, the maximum was probably not reached within the sampling period, fit is visually ok, but statistically not. ► **Conclusion**: no degradation, do not use this trial						
[redacted] **(phenyl-label)** *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0067	10.90	k: 0.467	+	104.1	346
(JAU 6476-desthio from maximum)						
SFO	M_0: 42.7 k: 0.005	1.95	k: <0.001	+	**127.7**	424
► JAU 6476-desthio shows degradation, fit is visually good but the t-test of the degradation rate fails. If JAU 6476-desthio is fitted from the maximum, the fit is statistically and visually good ► **Conclusion**: the formation fraction from prothioconazole might be taken into account, but has to be evaluated in comparison with other studies, where the DT_{50} is statistically reliable. Use Dt_{50} from decline fit.						
[redacted] **(triazole-label)** *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0069	13.23	k: 0.<0.001	+	**100.7**	334
► JAU 6476-desthio shows degradation, fit is visually and statistically good ► **Conclusion**: the degradation of JAU 6476-desthio can be used.						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel *cont.*
b) Visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.2- 8 *(cont.)*: <u>**Trigger**</u> **endpoints and statistical endpoints of JAU 6476-desthio *(M04)***
JAU 6476-desthio as parent

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted] **(2001)** (KCA 7.1.2.1.2 /02)						
[redacted] **am Hohenseh**						
SFO	M_0: 79.6 k: 0.026	19.40	k: 0.005	-	26.56	88.2
SFO, M_0 fix	k: 0.047	22.46	k: 0.002	-	14.86	49.4
FOMC	M_0: 92.3 α: 0.398 β: 2.20	3.50	-	+	10.36	714
FOMC, M_0 fix	α: 0.399 β: 2.23	3.32	-	+	**10.44**	714
DFOP	M_0: 91.5 k_1: 0.212 k_2: 0.007 g: 0.555	3.90	k_1: <0.001 k_2: 0.001 g: <0.001	+	9.00	208
DFOP, M_0 fix	k_1: 0.217 k_2: 0.007 g: 0.555	3.70	k_1: <0.001 k_2: <0.001 g: <0.001	+	8.79	206
► SFO fit is visually and statistically not acceptable, FOMC and DFOP describe the degradation of JAU 6476-desthio both good, but the FOMC with constrained M_0 fit is visually a bit better for the late data points ► **Conclusion**: use DT_{50} value from FOMC fit with constrained M_0						
[redacted] **A III**						
SFO	M_0: 89.3 k: 0.026	6.05	k: <0.001	+	27.15	90.2
SFO, M_0 fix	k: 0.028	7.80	k: <0.001	+	24.41	81.1
FOMC	M_0: 92.4 α: 1.477 β: 36.01	2.59	-	++	21.56	135
FOMC, M_0 fix	α: 1.321 β: 29.43	3.04	-	++	20.30	139
DFOP	M_0: 93.6 k_1: 0.181 k_2: 0.019 g: 0.241	1.59	k_1: 0.009 k_2: <0.001 g: 0.001	++	**22.92**	109
DFOP, M_0 fix	k_1: 0.200 k_2: 0.019 g: 0.236	1.59	k_1: 0.003 k_2: <0.001 g: <0.001	++	22.82	108
► SFO fit is visually and statistically good, but not more appropriate than FOMC. FOMC and DFOP describe the degradation of JAU 6476-desthio better, and the DFOP fit is considered a bit better than FOMC ► **Conclusion**: use DT_{50} value from DFOP						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel *cont.*
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.2- 8 *(cont.)*: **Trigger endpoints and statistical endpoints of JAU 6476-desthio *(M04)***
JAU 6476-desthio as parent

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted] **(2001)** (KCA 7.1.2.1.2 /02)						
[redacted]f AXXa						
SFO	M_0: 90.5 k: 0.110	10.48	k: <0.001	o	6.29	20.9
SFO, M_0 fix	k: 0.119	11.20	k: <0.001	o	5.84	19.4
FOMC	M_0: 93.4 α: 1.244 β: 6.88	3.69	-	++	**5.13**	36.9
FOMC, M_0 fix	α: 1.271 β: 6.55	3.64	-	++	5.03	36.9
DFOP	M_0: 92.8 k_1: 0.201 k_2: 0.025 g: 0.791	4.88	k_1: 0.001 k_2: 0.011 g: <0.001	++	5.21	42.0
DFOP, M_0 fix	k_1: 0.218 k_2: 0.027 g: 0.697	5.01	k_1: <0.001 k_2: 0.006 g: <0.001	++	4.99	41.5
► SFO fit is visually and statistically acceptable, but not more appropriate than FOMC. FOMC and DFOP describe the degradation of JAU 6476-desthio both very good, but the FOMC fit is considered a bit better than DFOP (as FOMC with M_0 free provides the worst case, this one is chosen over FOMC with fixed M_0). ► **Conclusion**: use DT_{50} value from FOMC						
Stanley						
SFO	M_0: 88.4 k: 0.043	8.59	k: <0.001	o	16.26	54.0
SFO, M_0 fix	k: 0.047	9.15	k: <0.001	o	14.90	49.5
FOMC	M_0: 91.8 α: 1.300 β: 18.28	2.48	-	++	**12.87**	89.2
FOMC, M_0 fix	α: 1.290 β: 17.98	2.36	-	++	12.80	89.2
DFOP	M_0: 92.0 k_1: 0.136 k_2: 0.020 g: 0.462	2.50	M_0: <0.001 k_1: 0.001 k_2: <0.001 g: <0.001	+	12.62	83.3
DFOP, M_0 fix	k_1: 0.135 k_2: 0.020 g: 0.463	2.35	k_1: <0.001 k_2: <0.001 g: <0.001	+	12.65	83.4
► SFO fit is visually and statistically acceptable, but not more appropriate than FOMC. FOMC and DFOP describe the degradation of JAU 6476-desthio both very good, but the FOMC fit is considered a bit better than DFOP (as FOMC with M_0 free provides the worst case, this one is chosen over FOMC with fixed M_0.) ► **Conclusion**: use DT_{50} value from FOMC						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.2- 9: Modelling endpoints and statistical endpoints of JAU 6476-desthio *(M04)* (non-normalised) based on prothioconazole studies

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted], M.; [redacted], P. (2000, rev. 2001) (KCA 7.1.2.1.1 /01)						
[redacted] *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0008 ff_{PTZ}: 0.481 ff_{Smet}: 0.0	7.56	k: 0.464 ff_{PTZ}: <0.001 ff_{Smet}: 0.5	+	922	> 1000
► JAU 6476-desthio shows nearly **no degradation**, the maximum was probably not reached within the sampling period, so further fits were not performed, fit is visually ok, but statistically not. No reliable formation fractions from prothioconazole or JAU 6476-S-methyl can be obtained. ► **Conclusion**: do not use this trial						
Stanley *(fit all together, start values for PTZ from DFOP fit)*						
SFO	M_0: 0 k: 0.0016 ff_{PTZ}: 0.292 ff_{Smet}: 0.0	3.34	k: 0.237 ff_{PTZ}: <0.001 ff_{Smet}: 0.5	+	433	> 1000
► JAU 6476-desthio shows nearly **no degradation**, the maximum was probably not reached within the sampling period, so further fits were not performed, fit is visually ok, but statistically not. No reliable formation fractions from prothioconazole or JAU 6476-S-methyl can be obtained. ► **Conclusion**: do not use this trial						
[redacted] (2001) (KCA 7.1.2.1.1 /02)						
Byromville (phenyl-label) *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0018 ff_{PTZ}: 0.3363 ff_{Smet}: 1.0	13.72	k: 0.397 ff_{PTZ}: <0.001 ff_{Smet}: 0.452	+	386	> 1000
(JAU 6476-desthio from max)						
SFO	M_0: 34.3 k: 0.002	14.18	k: 0.095	+	360	> 1000
► JAU 6476-desthio shows nearly **no degradation**, so further fits were not performed, fit is visually ok, but statistically not. No reliable formation fractions from prothioconazole or JAU 6476-S-methyl can be obtained.. ► **Conclusion**: do not use this trial						
Byromville (triazole-label) *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0016 ff_{PTZ}: 0.3392 ff_{Smet}: 1.0	11.05	k: 0.365 ff_{PTZ}: <0.001 ff_{Smet}: 0.434	o	365	> 1000
► JAU 6476-desthio shows nearly **no degradation**, the maximum was probably not reached within the sampling period, so further fits were not performed, fit is visually ok, but statistically not. No reliable formation fractions from prothioconazole or JAU 6476-S-methyl can be obtained ► **Conclusion**: do not use this trial						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel *cont.*
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.2- 9 *(cont.):* **Modelling endpoints and statistical endpoints of JAU 6476-desthio *(M04)* (non-normalised)** based on prothioconazole studies

Type of kinetics[a)]	Fitted parameters	X^2 error	p (t-test)	Visual fit [b)]	DT_{50}	DT_{90}
[redacted] **(2001)** (KCA 7.1.2.1.1 /02)						
[redacted] **(phenyl-label)** *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0067 ff_{PTZ}: 0.4855 ff_{Smet}: 1.0	10.90	k: 0.467 ff_{PTZ}: <0.001 ff_{Smet}: 0.494	+	104.1	346
(JAU 6476-desthio from max)						
SFO	M_0: 42.7 k: 0.005	11.95	k: <0.001	+	**127.7**	424
► JAU 6476- Desthio shows degradation, fit is visually good and but the t-test of the degradation rate fails. When fitted from maximum, fit is visually and statistically good. No reliable formation fractions from prothioconazole or JAU 6476S-methyl can be obtained. ► **Conclusion**: use DT_{50} value from decline fit.						
[redacted] **(triazole-label)** *(fit all together, start values for prothioconazole from FOMC fit)*						
SFO	M_0: 0 k: 0.0069 ff_{PTZ}: **0.5123** ff_{Smet}: 1.0	13.23	k: <0.001 ff_{PTZ}: <0.001	+	**100.7**	334
► JAU 6476-desthio shows degradation, fit is visually and statistically good. No reliable formation fractions from JAU 6476S-methyl can be obtained. ► **Conclusion**: formation fraction and DT_{50} from prothioconazole can be used.						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel *cont.*
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.2- 9 *(cont.)*: **<u>Modelling</u> endpoints and statistical endpoints of JAU 6476-desthio *(M04)***
JAU 6476-desthio as parent

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted] (2001) (KCA 7.1.2.1.2 /02)						
[redacted] am Hohenseh						
SFO	M_0: 79.6 k: 0.026	19.40	k: 0.005	-	26.56	88.2
SFO, M_0 fix	k: 0.047	22.46	k: 0.002	-	14.86	49.4
FOMC	M_0: 92.3 α: 0.398 β: 2.20	3.50	-	+	10.36	714
DFOP	M_0: 91.5 k_1: 0.212 k_2: 0.007 g: 0.555	3.90	k_1: <0.001 k_2: 0.001 g: : <0.001	++	9.00 slow phase: **96.4**	208
► SFO fit is visually and statistically not acceptable, modification like constraining M_0 does not help, as the data points are obviously bi-phasic. Both, FOMC and DFOP describe the degradation of JAU 6476-desthio good, but as the concentration at the end is above 10% of the initially measured concentration, the slow phase DT_{50} from DFOP is used ► **Conclusion**: use slow phase DT_{50} value from DFOP (96.4 days)						
[redacted] A III						
SFO	M_0: 89.3 k: 0.026	6.05	k: <0.001	+	**27.2**	90.2
► SFO fit is visually and statistically good ► **Conclusion**: use DT_{50} value from SFO						
[redacted] f AXXa						
SFO	M_0: 90.5 k: 0.110	10.48	k: <0.001	o	6.29	20.9
FOMC	M_0: 93.4 α: 1.244 β: 6.88	3.69		++	5.13 **11.13[c)]**	36.9
► SFO fit is visually and statistically acceptable, but FOMC fit is better ► **Conclusion**: use back-calculated DT_{50} value from FOMC (36.94 days / 3.332 = 11.13 days)						
Stanley						
SFO	M_0: 88.4 k: 0.043	8.59	M_0: <0.001 k: <0.001	o	16.3	54.0
FOMC	M_0: 91.8 α: 1.300 β: 18.28	2.48	-	++	12.87 **26.86[c)]**	89.2
► SFO fit is visually and statistically acceptable, but FOMC fit is better ► **Conclusion**: use back-calculated DT_{50} value from FOMC (89.2 days / 3.332 = 26.86 days)						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: ++ = good, o = moderate, - = poor
c) back-calculated from DT_{90}

III. CONCLUSIONS

The DT_{50} values (trigger endpoints) for <u>JAU 6476-S-methyl *(M01)*</u> range from 3.1 to 275 days, with a geometric mean of 42.4days.
The unnormalised modelling endpoints range from 11.1 to 279.8 days. The normalised (20°C, pF2) modelling endpoints range from 10.6 to 156.3 days with a geometric mean of 46.4 days. The derived

degradation rates are considered appropriate as input for modelling purposes. Also for JAU 6476-S-methyl it has to be mentioned, that the degradation was much slower in the studies in which the parent was applied than in the study where JAU 6476-S-methyl was applied as a pseudo-parent.

DT_{50} values (trigger endpoints) for JAU 6476-desthio *(M04)* range from 5.1 to 127.7 days, with a geometric mean of 24.2 days. The unnormalised modelling endpoints range from 11.1 to 127.7 days. The normalised (20°C, pF2) modelling endpoints range from 8.9 to 146.5 days with a geometric mean of 39.4 days. JAU 6476-desthio showed nearly no degradation in three of four soils in the [redacted] study (together with parent and JAU 6476-S-methyl). Regarding the availability of a valid endpoints of a field study, this might be of minor relevance.

CA 7.1.2.1.3 Anaerobic degradation of the active substance

Due to the proposed use pattern of prothioconazole as a fungicide applied to cereals and rape, an anaerobic soil degradation study was not considered to be required. Therefore no studies on the route and rate of degradation of prothioconazole in soil under anaerobic conditions were submitted for the Annex I inclusion. However, an anaerobic soil metabolism and degradation study of prothioconazole was performed in 2014 and is submitted within this Supplemental Dossier for the prothioconazole renewal approval ([redacted] and [redacted], 2014, KCA 7.1.1.2 /01 & KCA 7.1.2.1.3 /01).

In addition a kinetic evaluation was conducted to derive kinetic parameters according to FOCUS kinetics (FOCUS, 2014[1]) for prothioconazole and its major soil metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* ([redacted] and [redacted], 2015), submitted in this Supplemental Dossier, (KCA 7.1.2.1.3 /02 & KCA 7.1.2.1.4 /01).

New study submitted for Annex I Renewal
Justification for including this study in the Annex I Renewal Dossier: This study was conducted to cover metabolism and degradation of prothioconazole in soil under anaerobic conditions.

Report:	**KCA 7.1.2.1.3 /01; [redacted], O.; [redacted], D.; 2014**
Title:	[Phenyl-UL-14C]prothioconazole: anaerobic degradation / metabolism in one soil
Report No:	EnSa-13-0675
Document No:	M-494101-01-1
Guidelines:	- OECD Test Guideline No. 307 - Commission Regulation (EU) No 283/2013 in accordance with Regulation (EC) No 1107/2009 - US EPA OCSPP Test Guideline No. 835.4100 / 835.4200 with additional NAFTA requirements - FOCUS (2006): "Guidance Document on Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration" Report of the FOCUS Work Group on Degradation Kinetics, EC Document Reference Sanco/10058/2005 version 2.0, 434 pp
GLP:	Yes
Justification:	New data

Executive Summary

The degradation data as reported in study KCA 7.1.1.2 /01 were kinetically evaluated according to FOCUS Kinetics report (FOCUS, 2006). The experimental data could be well described by a double first order in parallel (DFOP) kinetic model. The half-life of prothioconazole under anaerobic conditions was 2.8 days in soil [redacted].

I. MATERIALS AND METHODS

Details on the study conduct and its results are summarised under KCA 7.1.1.2 /01. Nonlinear regression analysis was used to determine the kinetic parameters (KinGUI 2), and linear regression analysis was used to determine the radioactivity detector response.
For the evaluation of the data three different kinetic models (Single First Order Model (SFO), First Order Multi Compartment Model) FOMC) and Double First Order in Parallel Model (DFOP)) were tested in order to determine the best-fit kinetic model. The best-fit kinetic model was selected on the basis of the chi^2 scaled-error criterion and on the basis of a visual assessment of the goodness of the fits. DT_{50} and

[1] FOCUS, 2014: Generic guidance for Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration, Version: 1.1; Date: 18 December 2014

DT_{90} values were calculated from the resulting kinetic parameters. The corresponding regression reports to the respective regression curves and the diagrams that were used for the visual assessment are shown

II. RESULTS AND DISCUSSION

The SFO, FOMC and DFOP models were used to fit the observed degradation of prothioconazole in the anaerobic soil metabolism study.

The degradation of prothioconazole followed double first order in parallel (DFOP) kinetics based on chi^2 error values and visual assessments of fits.

The chi^2 scaled-error statistic for the SFO model was 24.3%, with calculated DT_{50} and DT_{90} values of 8.8 and 29.4 days, respectively. The chi^2 scaled-error statistic for the FOMC model was 11.8%, with calculated DT_{50} and DT_{90} values of 4.3 and 92.9 days, respectively. The chi^2 scaled-error statistic for the DFOP model was 9.3%, with calculated DT_{50} and DT_{90} values of 2.8 and 55.4 days, respectively. The SFO, FOMC and DFOP kinetic end-points are summarised in Table 7.1.2.1.3- 1.

Table 7.1.2.1.3- 1: Summary of the kinetic evaluation (for trigger values according to FOCUS) of the degradation of prothioconazole under anaerobic conditions

Soil (Texture (USDA))	Kinetic Model[a,b]	DT_{50} [days]	DT_{90} [days]	Chi^2 error [%]	Visual Assessment[c]
[redacted] (silt loam)	SFO	8.8	29.4	24.3	o
	FOMC	4.3	92.9	11.8	+
	DFOP	**2.8**	**55.4**	**9.3**	+

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) best fits highlighted in **bold** letters
c) visual assessment: + = good, o = moderate, - = poor

III. CONCLUSIONS

Prothioconazole will be rapidly degraded in soil under anaerobic conditions following an aerobic incubation phase. Formation of significant amounts of non-extractable residues indicates a participation of prothioconazole in the natural carbon cycle of soil. Therefore, prothioconazole and its degradation products are not expected to have a potential for accumulation in the environment.

New kinetic evaluation submitted for Annex I Renewal

Justification for including this study in the Annex I Renewal Dossier: The objective of this study is a kinetic evaluation of the anaerobic soil metabolism study of prothioconazole ([redacted] and [redacted], 2014, KCA 7.1.1.2 /01 & KCA 7.1.2.1.3 /01). The kinetic evaluation was conducted to derive trigger and modelling endpoints according to FOCUS Guidance 2014 for prothioconazole and its major soil degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)*.

Report:	**KCA 7.1.2.1.3 /02; [redacted], A.C.; [redacted], C.; 2015**
Title:	Prothioconazole (PTZ) kinetics anaerobic soil - Kinetic evaluation (trigger and modelling endpoints) of the degradation of prothioconazole and its soil metabolites desthio and S-methyl under anaerobic soil conditions in laboratory
Report No:	EnSa-15-0385
Document No:	M-531375-01-1
Guidelines:	FOCUS, 2014: Generic Guidance for Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration, Version: 1.1; Date: 18 December 2014
GLP:	No (calculation)
Justification:	The objective of this study is a kinetic evaluation of the anaerobic soil metabolism study of prothioconazole to derive trigger and modelling endpoints for prothioconazole and its major soil degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* according to FOCUS Guidance 2014

Executive Summary

The purpose of this study was to estimate degradation times (DT_{50}) for prothioconazole and its metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* for use in model simulations of environmental exposure (modelling endpoints) and to estimate trigger endpoints (trigger endpoints) under anaerobic conditions.

The degradation of prothioconazole under anaerobic laboratory conditions was investigated in one soil ([redacted] am Hohensee 4a, [redacted] and [redacted], 2014, KCA 7.1.1.2 /01).

The present report comprises the evaluation of the data according to the most recent FOCUS Kinetics report (FOCUS, 2014). Degradation parameters were fitted with the software KinGUI 2.1. To account for anaerobic conditions, the data three days after flooding were evaluated, when dropped to around 1 mg/L oxygen and redoxpotential (Eh) reached values around 200 mV (Different to the kinetic evaluation in the report of ([redacted] and [redacted], 2014, KCA 7.1.2.1.3 /01)) .

The DT_{50} values (trigger and modelling) derived by the evaluation of the laboratory trials for prothioconazole are shown in Table 7.1.2.1.3- 2:

Table 7.1.2.1.3- 2: Trigger and modelling endpoints of prothioconazole

Study	Annex Point / Reference No	Soil	Day after soil flooding	Kinetic type[a)]	DT_{50} [days]
Trigger endpoint					
[redacted], O.; [redacted], D. (2014)	KCA 7.1.1.2 /01	[redacted]	3	FOMC	18.64
Modelling endpoint					
[redacted], O.; [redacted], D. (2014)	KCA 7.1.1.2 /01	[redacted]	3	SFO	22.65

a) SFO: single first order, FOMC: sirst order multi compartment, DFOP: double first order in parallel

I. METHODS

Soil residue data from the anaerobic soil degradation study ([redacted] and [redacted], 2014, KCA 7.1.1.2 /**01**) were used. In this study, the degradation of prothioconazole was studied in one soil ([redacted], silt loam) at 20.3°C in the dark in the laboratory under anaerobic conditions for 120 days following an aerobic incubation phase of 6 hours (total study duration of 120 days), and a test concentrations of 200 g a.s./ha.

The kinetic analysis was performed according to FOCUS kinetics (2014) using the software KinGUI 2 with four different kinetic models: Single First-Order (SFO) and the bi-exponential models FOMC (First-Order Multi-Compartment model), DFOP (double first order parallel) and HS (Hockey-stick). Calculation of DT_{50} / DT_{90} values: A half-life is defined as the time taken for 50% of substance to disappear/dissipate from a compartment following single first-order kinetics, whereas DT_{50} and DT_{90} values are not strictly connected to a first order kinetics. In this report half-lives, DT_{50} and DT_{90} values are calculated from the appropriate rate constant k as $DT_{50} = \ln(2)/k$ and $DT_{90} = \ln(10)/k$, respectively.

In the study of [redacted] and [redacted], 2014 (KCA 7.1.1.2 /01), it is assumed that immediately after flooding the soil with water (flooded soil was flushed with argon, additionally the whole test system was placed into a nitrogen flooded box) anaerobic conditions are established. However, as it can be seen from the oxygen content and the redox potential (Table 7.1.2.1.3- 3) only values from day 3 and onwards should be considered as anaerobic, as then, these two parameters are more stable. Therefore, to account for anaerobic conditions, the data three days after flooding were evaluated, when dropped to around 1 mg/L oxygen and redoxpotential (Eh) reached values around 200 mV.

Table 7.1.2.1.3- 3: Residue values for prothioconazole, JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)*, oxygen content and redox potential with time in soil [redacted], taken from the study of [redacted] and [redacted], 2014 (KCA 7.1.1.2 /01)

Days after application	Prothioconazole [%AR]	JAU 6476-S-methyl *(M01)* [%AR]	JAU 6476-desthio *(M04)* [%AR]	O_2 content [mg/L]	Redoxpotential Eh [mV]
0	91.8	NA	2.0	Aerobic conditions, flooded after 0.25 days	
0	90.7	NA	1.6		
0.25	53.0	5.2	13.8		
0.25	57.4	4.1	11.3		
0.25	46.6	5.8	15.6	3.89	393
0.25	44.3	6.4	16.6	3.35	405
3	21.9	16.0	23.3	1.87	202
3	22.4	17.0	23.7	1.97	209
7	22.2	19.7	22.0	0.87	155
7	22.0	18.2	22.4	0.90	130
14	15.0	23.8	21.2	1.35	87
14	14.8	23.2	21.3	0.68	107
30	7.7	28.8	19.6	0.47	113
30	8.0	28.2	19.5	1.30	100
59	5.0	31.9	18.4	0.66	38
59	4.7	32.1	18.6	0.62	56
90	3.4	33.8	18.5	1.40	91
90	3.3	32.2	19.1	0.45	93
120	3.1	33.7	20.5	0.53	58
120	2.8	33.7	20.2	0.67	47

II. RESULTS AND DISCUSSION

Trigger endpoints and modelling endpoints for prothioconazole and its metabolites were derived following the procedure described in FOCUS (2014).
The trigger and modelling endpoints and statistical parameters for prothioconazole are given in Table 7.1.2.1.3- 4 and Table 7.1.2.1.3- 5, respectively. A summary of the best fits of the trigger and modelling endpoints of prothioconazole is given in Table 7.1.2.1.3- 2 in the Executive Summary of this report.

Table 7.1.2.1.3- 4: <u>Trigger</u> endpoints and statistical parameters of prothioconazole
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit[b)]	DT_{50} [days]	DT_{90} [days]
[redacted] and [redacted], 2014 (KCA 7.1.1.2/01)						
[redacted]						
Prothioconazole fit alone						
SFO	M_0: 22.6 k: 0.031	11.88	k: <0.001	o	22.65	75.2
FOMC	M_0: 23.5 α: 1.680 β: 36.5	9.33	-	+	**18.64**	107.2
DFOP	M_0: 23.5 k_1: 0.047 k_2: <0.001 g: 0.875	8.70	k_1: 0.002 k_2: 0.5 g: <0.001	++	18.08	>1000
Prothioconazole pathway fit						
FOMC	M_0: 22.7 α: 1.877 β: 47.5	9.90	---	+	21.21	114.4

► SFO fit not more appropriate than FOMC. Therefore, FOMC and DFOP were fitted but DFOP fails (t-test). Therefore, FOMC is chosen
► **Conclusion**: use DT_{50} of FOMC = 18.64 days as trigger endpoint

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.3- 5: **Modelling endpoints and statistical parameters of prothioconazole**
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X² error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted] and [redacted], 2014 (KCA 7.1.1.2 /01)						
[redacted]						
Prothioconazole fit alone						
SFO	M_0: 22.6 k: 0.031	11.9	k: <0.001	o	**22.65**	75.2
DFOP	M_0: 23.5 k_1: 0.047 k_2: <0.001 g = 0.875	8.7	k_1: 0.002 k_2: 0.5	++	18.08	>1000
HS	M_0: 22.6 k_1: 0.004 k_2: 0.031 tb < 0.001	14.14	k_1: 0.5 k_2: <0.001	-	22.65	75.2
Prothioconazole pathway fit						
SFO	M_0: 22.6 k: 0.0304	11.9	k: <0.001	o	22.83	75.8

► SFO is visually just acceptable. As last data point(s) are <10% of initial, the DFOP and HS model was fitted, but resulted in poor statistical values for the k_2
► **Conclusion**: use DT_{50} of SFO = 22.7 days as modelling endpoint

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

III. CONCLUSIONS

The DT_{50} values (trigger and modelling) for prothioconazole are 18.6 days and 22.7 days, respectively.

CA 7.1.2.1.4 Anaerobic degradation of metabolites, breakdown and reaction products

New kinetic evaluation submitted for Annex I Renewal

Justification for including this study in the Annex I Renewal Dossier: The objective of this study is a kinetic evaluation of the anaerobic soil metabolism study of prothioconazole ([redacted] and [redacted], 2014, KCA 7.1.1.2 /01 & KCA 7.1.2.1.3 /01). The kinetic evaluation was conducted to derive trigger and modelling endpoints according to FOCUS Guidance 2014 for prothioconazole and its major soil degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)*.

Report:	**KCA 7.1.2.1.4 /01; [redacted], A.C.; [redacted], C.; 2015**
Title:	Prothioconazole (PTZ) kinetics anaerobic soil - Kinetic evaluation (trigger and modelling endpoints) of the degradation of prothioconazole and its soil metabolites desthio and S-methyl under anaerobic soil conditions in laboratory
Report No:	EnSa-15-0385
Document No:	M-531375-01-1
Guidelines:	FOCUS, 2014: Generic Guidance for Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration, Version: 1.1; Date: 18 December 2014
GLP:	No (calculation)
Justification:	The objective of this study is a kinetic evaluation of the anaerobic soil metabolism study of prothioconazole to derive trigger and modelling endpoints for prothioconazole and its major soil degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* according to FOCUS Guidance 2014

Executive Summary

The purpose of this study was to estimate degradation times (DT_{50}) for prothioconazole and its metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* for use in model simulations of environmental exposure (modelling endpoints) and to estimate trigger endpoints (trigger endpoints) under anaerobic conditions.

The degradation of prothioconazole under anaerobic laboratory conditions was investigated in one soil ([redacted], am Hohensee 4a, [redacted] and [redacted], 2014, KCA 7.1.1.2 /01).

The present report comprises the evaluation of the data according to the most recent FOCUS Kinetics report (FOCUS, 2014). Degradation parameters were fitted with the software KinGUI 2.1. <u>To account for anaerobic conditions, the data three days after flooding were evaluated</u>, when dropped to around 1 mg/L oxygen and redoxpotential (Eh) reached values around 200 mV (Different to the kinetic evaluation in the report of ([redacted] and [redacted], 2014, KCA 7.1.2.1.3 /01)) .

The DT_{50} values (trigger and modelling) derived by the evaluation of the laboratory trials for the prothioconazole metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* are shown in Table 7.1.2.1.4- 1 and Table 7.1.2.1.4- 2, respectively.

Table 7.1.2.1.4- 1: Trigger and modelling endpoints of JAU 6476-S-methyl *(M01)*

Study	Annex Point / Reference No	Soil	Day after soil flooding	Kinetic type[a)]	DT_{50} [days]
Trigger endpoint					
[redacted], O.; [redacted], D. (2014)	KCA 7.1.1.2 /01	[redacted]	3	SFO	746[a)]
Modelling endpoint					
[redacted], O.; [redacted], D. (2014)	KCA 7.1.1.2 /01	[redacted]	3	SFO	433[a)]

a) maximum not reached during study period

Table 7.1.2.1.4- 2: Trigger and modelling endpoints of JAU 6476-desthio *(M04)*

Study	Annex Point / Reference No	Soil	Day after soil flooding	Kinetic type[a)]	DT_{50} [days]
Trigger endpoint					
[redacted], O.; [redacted], D. (2014)	KCA 7.1.1.2 /01	[redacted]	3	SFO	250[a)]
Modelling endpoint					
[redacted], O.; [redacted], D. (2014)	KCA 7.1.1.2 /01	[redacted]	3	SFO	181[a)]

a) maximum not reached during study period

I. METHODS

Detailed information on the kinetic analysis is given in the corresponding chapter of the parent compound in section CA 7.1.2.1.3 (KCA 7.1.2.1.3/02).

II. RESULTS AND DISCUSSION

Trigger endpoints and modelling endpoints for the prothioconazole metabolites were derived following the procedure described in FOCUS (2014).

The trigger and modelling endpoints and statistical parameters for JAU 6476-S-methyl *(M01)* are given in Table 7.1.2.1.4- 3 and Table 7.1.2.1.4- 4, respectively.

The trigger and modelling endpoints and statistical parameters for JAU 6476-desthio *(M04)* are given in Table 7.1.2.1.4- 5 and Table 7.1.2.1.4- 6, respectively.

A summary of the best fits of the trigger and modelling endpoints of the metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* are shown in the Executive Summary of this report in Table 7.1.2.1.4- 1 and Table 7.1.2.1.4- 2, respectively.

Table 7.1.2.1.4- 3: Trigger endpoints and statistical parameters of JAU 6476-S-methyl *(M01)*
(All simultaneously, best fit of parent)
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted] **and** [redacted]**, 2014** (KCA 7.1.1.2 /01) [redacted]						
SFO	M_0: 16.16 k: 0.0009 ff_{PTZ}: 1	0.86	k: 0.002	++	**746**	> 1000
► JAU 6476-S-methyl shows **no degradation**, but SFO fit (with best-fit from parent) was statistically and visually very good. ► **Conclusion:** fit was considered visually and statistically acceptable. DT_{50} of JAU 6476-S-methyl can be used.						

a) SFO: single first order, FOMC: sirst order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.4- 4: Modelling endpoints and statistical parameters of JAU 6476-S-methyl *(M01)*
(All simultaneously, best fit of parent)
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted] **and** [redacted]**, 2014** (KCA 7.1.1.2 /01) [redacted]						
SFO	M_0: 16.71 k: 0.0016 ff_{PTZ}: 1	1.8	k: <0.001	++	**433**	> 1000
► JAU 6476-S-methyl shows **no degradation**, but SFO fit (with best-fit from parent) was statistically and visually very good. ► **Conclusion:** fit was considered visually and statistically acceptable. DT_{50} of JAU 6476-S-methyl can be used.						

a) SFO: single first order, FOMC: sirst order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.4- 5: Trigger endpoints and statistical parameters of JAU 6476-desthio *(M04)*
(All simultaneously, best fit of parent)
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
[redacted] **and** [redacted]**, 2014** (KCA 7.1.1.2 /01) [redacted]						
SFO	M_0: 21.92 k: 0.0028 ff_{PTZ}: 0 ff_{Smet}: 1	5.55	k: <0.001	-	250	829
► SFO fit is statistically acceptable, but visually not acceptable due to increasing concentrations until the end of the study period ► **Conclusion:** DT_{50} should not be used						

a) SFO: single first order, FOMC: sirst order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

Table 7.1.2.1.4- 6: Modelling endpoints and statistical parameters of JAU 6476-desthio *(M04)*
(All simultaneously, best fit of parent)
best fits highlighted in **bold letters**

Type of kinetics[a)]	**Fitted parameters**	**X^2 error** [%]	**p** (t-test)	**Visual fit [b)]**	**DT_{50} [days]**	**DT_{90} [days]**
[redacted] **and** [redacted]**, 2014** (KCA 7.1.1.2 /01) [redacted]						
SFO	M_0: 22.02 k: 0.0038 ff_{PTZ}: 0 ff_{Smet}: 1	5.3	k: <0.001	-	181	601
► SFO fit is statistically acceptable, but visually not acceptable due to increasing concentrations until the end of the study period ► **Conclusion:** DT_{50} should not be used						

a) SFO: single first order, FOMC: sirst order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

III. CONCLUSIONS

The DT_{50} values (trigger and modelling) for JAU 6476-S-methyl *(M01)* are 746 days and 433 days, respectively.
The DT_{50} values (trigger and modelling) for JAU 6476-desthio *(M04)* are 250 days and 181 days, respectively. As the SFO fit is statistically acceptable, but visually not acceptable due to increasing concentrations until the end of the study period the DT_{50} values should not be used.

CA 7.1.2.2 Field studies

The dissipation and degradation of prothioconazole and its major soil metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* were studied at eight sites in Germany, Great Britain, France, and Italy using unlabelled prothioconazole formulated as EC 250. Half of the trials were conducted without vegetation, while the other half of the trials were cropped with spring barley in the first and grass in the second year. The trial locations are characterised by different soil types and climates.

Based on this study a new kinetic evaluation was performed to estimate dissipation times (DT_{50}) for prothioconazole and its major soil metabolites JAU 6476-desthio *(M04)* at study conditions for use as trigger endpoints. A summary of these trigger endpoints is given in Table 7.1.2.2- 1 for prothioconazole and in Table 7.1.2.2- 3 for JAU 6476-desthio, respectively.

Based on these trials two kinetic evaluations were also performed to estimate normalised (20°C, pF 2) dissipation times (DT_{50}) for use in model simulations of environmental exposures (modelling endpoints) for prothioconazole and the metabolite JAU 6476-desthio. A summary of these modelling endpoints is given in Table 7.1.2.2- 2 for prothioconazole and in Table 7.1.2.2- 4 for JAU 6476-desthio, respectively.

For refinement of wash-off modelling, a kinetic evaluation of several plant residue data of prothioconazole in leafy plant material was performed. As prothioconazole is known to degrade rapidly to its metabolites and as its main metabolite, JAU 6476-desthio *(M04)*, is the compound of principal interest, decline curves were derived bearing in mind that the foliar DT_{50} of JAU 6476-desthio is the main focus. A foliar dissipation DT_{50} of JAU 6476-desthio as input for wash-off modelling is derived. A summary of these foliar DT_{50} values is given in Table 7.1.2.2- 5.

Table 7.1.2.2- 1: Summary of the trigger endpoints (field DT_{50}) of prothioconazole

Trial / Location	Annex Point / Reference No	Kinetic type[a)]	DT_{50} [days]
R812587 (Germany)	KCA 7.1.2.2.1 /05	SFO	1.6
R812595 (Great Britain)	KCA 7.1.2.2.1 /05	Fit not acceptable	--
R812609 (France, North)	KCA 7.1.2.2.1 /05	SFO	1.2
R812617 (Great Britain)	KCA 7.1.2.2.1 /05	Fit not acceptable	--
R812625 (France, North)	KCA 7.1.2.2.1 /05	SFO	1.2
R812633 (France, South)	KCA 7.1.2.2.1 /05	SFO	1.4
R815667 (Italy)	KCA 7.1.2.2.1 /05	SFO	1.4
R815675 (Germany)	KCA 7.1.2.2.1 /05	SFO	1.5
Geometric mean			**1.4**

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

Table 7.1.2.2- 2: Summary of the DT_{50} values for prothioconazole normalised to reference conditions of 20°C and pF2 (modelling endpoints)

Trial / Location	Annex Point / Reference No	Kinetic type[a)]	DT_{50} [days]
R812587 (Germany)	KCA 7.1.2.2.1 /06	SFO	1.32
R812595 (Great Britain)	KCA 7.1.2.2.1 /06	SFO	1.09
R812609 (France, North)	KCA 7.1.2.2.1 /06	SFO	0.75
R812617 (Great Britain)	KCA 7.1.2.2.1 /06	SFO	1.38
R812625 (France, North)	KCA 7.1.2.2.1 /06	SFO	0.73
R812633 (France, South)	KCA 7.1.2.2.1 /06	SFO	0.70
R815667 (Italy)	KCA 7.1.2.2.1 /06	SFO	0.97
R815675 (Germany)	KCA 7.1.2.2.1 /06	SFO	0.82
Geometric mean			**0.94**
Median			**0.90**

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

Table 7.1.2.2- 3: Summary of the trigger endpoints (field DT_{50}) of JAU 6476-desthio *(M04)*

Trial / Location	Annex Point / Reference No	Kinetic type[a)]	DT_{50} [days]
R812587 (Germany)	KCA 7.1.2.2.1 /05	SFO	16.2
R812595 (Great Britain)	KCA 7.1.2.2.1 /05	SFO	50.9
R812609 (France, North)	KCA 7.1.2.2.1 /05	SFO	55.6
R812617 (Great Britain)	KCA 7.1.2.2.1 /05	SFO	49.3
R812625 (France, North)	KCA 7.1.2.2.1 /05	SFO	48.4
R812633 (France, South)	KCA 7.1.2.2.1 /05	SFO	63.4
R815667 (Italy)	KCA 7.1.2.2.1 /05	SFO	32.2
R815675 (Germany)	KCA 7.1.2.2.1 /05	SFO	27.0
Geometric mean			**39.6**

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

Table 7.1.2.2- 4: Summary of the DT_{50} values of JAU 6476-desthio *(M04)* normalised to reference conditions of 20°C and pF2 (modelling endpoints)

Trial / Location	Annex Point / Reference No	Kinetic type[a)]	DT_{50} [days]
R812587 (Germany)	KCA 7.1.2.2.1 /07	--	not used
R812595 (Great Britain)	KCA 7.1.2.2.1 /07	SFO	24.7
R812609 (France, North)	KCA 7.1.2.2.1 /07	SFO	23.8
R812617 (Great Britain)	KCA 7.1.2.2.1 /07	SFO	23.3
R812625 (France, North)	KCA 7.1.2.2.1 /07	SFO	23.8
R812633 (France, South)	KCA 7.1.2.2.1 /07	SFO	32.2
R815667 (Italy)	KCA 7.1.2.2.1 /07	SFO	28.7
R815675 (Germany)	KCA 7.1.2.2.1 /07	SFO	18.8
Geometric mean			**24.7**

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

Table 7.1.2.2- 5: Summary of foliar DT_{50} values of JAU 6476-desthio *(M04)* (all fits are SFO[a)])

Trial / Location	Annex Point / Reference No	Crop	DT_{50} [days]
13-2951-01 (UK)	KCA 7.1.2.2 /01 based on KCA 7.1.2.2 /02	Oil seed rape	2.8
13-2951-03 (Belgium)	KCA 7.1.2.2 /01 based on KCA 7.1.2.2 /03	Oil seed rape	4.5
13-2951-04 (Holland)	KCA 7.1.2.2 /01 based on KCA 7.1.2.2 /03	Oil seed rape	3.1
R 2006 0030/5 (Holland)	KCA 7.1.2.2 /01 based on KCA 7.1.2.2 /04	Onions	4.8
R 2005 0023/8 (Spain)	KCA 7.1.2.2 /01 based on KCA 7.1.2.2 /05	Field peas	8.0
J6043-01W (FL, USA)	KCA 7.1.2.2 /01 based on KCA 7.1.2.2 /06	Turf	1.4
R 2007 0425/9 (Italy)	KCA 7.1.2.2 /01 based on KCA 7.1.2.2 /07	Wheat	24.0
JA008-05D (NE, USA)	KCA 7.1.2.2 /01 based on KCA 7.1.2.2 /08	Soy beans	1.3
Minimum			**1.3**
Maximum			**24.0**
Geometric mean			**4.0**
Median			**3.8**

a) SFO: single first order

Data for determination of a foliar half-life for wash-off modelling

The foliar half-life of the compound applied within the FOCUS surface water model or groundwater models is set as a default value of 10 days. It is possible to use a shorter half-life if justified, either by a specific experiment or by deriving a half-life from field crop residue and field dislodgeable residue studies. The latter two study types are assessed such that rainfall is excluded. For any data used in the assessment of the half-life, the period of the calculation must have <= 3mm rainfall and three or more data points. The data is assessed following standard procedures laid down in FOCUS Kinetics (2014).

Kinetic evaluation of residues in leafy plant material to derive a foliar DT_{50} for wash-off modelling

Justification for including this study in the Annex I Renewal Dossier: The objective of this study is a kinetic evaluation of the residues of JAU 6476-desthio *(M04)* in leafy plant material to derive a foliar DT_{50} for wash-off modelling as available from plant decline studies. The evaluation was conducted to derive kinetic parameters according to FOCUS Guidance 2014).

Report:	**KCA 7.1.2.2 /01; [redacted], A.; 2015**
Title:	Prothioconazole (PTZ) Kinetics Field Foliar Half Life - Kinetic evaluation of the residues of the prothioconazole metabolite, JAU6476-desthio, in leafy plant material to derive a foliar DT50 for wash-off modelling
Report No:	EnSa-15-0264
Document No:	M-532620-01-1
Guidelines:	FOCUS, 2014: Generic guidance for Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration, Version: 1.1; Date: 18 December 2014
GLP:	No (calculation)
Justification:	Kinetic evaluation of the residues of JAU 6476-desthio *(M04)*, in leafy plant material to derive a foliar DT_{50} for wash-off modelling

Executive Summary

This report provides a kinetic evaluation of total plant residue data of prothioconazole in leafy plant material (*e.g.,* cereals, leafy vegetables) as available from plant residue decline studies under field conditions. As prothioconazole is known to degrade rapidly to its metabolites and as its main metabolite, JAU 6476-desthio *(M04)*, is the compound of principal interest, decline curves were derived bearing in mind that the foliar DT_{50} of JAU 6476-desthio is the main focus. A foliar dissipation DT_{50} of JAU 6476-desthio as input for wash-off modelling is derived.

In general, a conservative foliar DT_{50} can be derived from crop residue decline studies, done on leafy crops. However, the total residues in the plant should not be influenced or washed off by rain or irrigation during the evaluated period (cut-off criteria set to water to foliage should be < 3 mm). Otherwise, the decline might be caused by wash-off and not only by foliar dissipation. Finally, foliar DT_{50} on total residues derived in this manner can be considered as conservative and usable as foliar DT_{50} of washable or dislodgeable residues. Decline of dislodgeable residues is expected to be systematically shorter compared to the decline of total crop residues.

The single first-order (SFO) half-lives of JAU 6476-desthio derived in this evaluation are summarised in Table 7.1.2.2- 6 and are considered suitable as modelling input for wash-off calculations. In total, 8 data sets from 6 reports were useable and gave reliable DT_{50}s.

Table 7.1.2.2- 6: Summary of foliar DT_{50} values for JAU 6476-desthio *(M04)* (all fits are SFO)

Author	Trial code	Trial description	Report code	Crop	DT_{50} [days]
[redacted], J.; [redacted], C. (2013)	M-466558-02-1	13-2951-01 (UK)	B1	oil seed rape	2.8
		13-2951-03 (Belgium)	B2	oil seed rape	4.5
		13-2951-04 (Holland)	B3	oil seed rape	3.1
[redacted], T. (2007)	M-282998-01-1	R 2006 0030/5 (Holland)	C	onions	4.8
[redacted], T.; [redacted], K. (2006)	M-275434-01-1	R 2005 0023/8 (Spain)	F	field peas	8.0
[redacted], A.T. et al. (2004)	M-020969-01-1	J6043-01W (FL, USA)	J	turf	1.4
[redacted], R.; [redacted], S. (2008)	M-298110-02-1	R 2007 0425/9 (Italy)	K	wheat	24.0
[redacted], M.E.; [redacted], E.C. (2008)	M-281571-03-1	JA008-05D (NE, USA)[a)]	P	soy beans	1.3
Minimum					**1.3**
Maximum					**24.0**
Geometric mean					**4.0**
Median					**3.8**

a) DFR (dislodgeable foliar residue study)

I. METHODS

In general, for certain predictive leaching models, a foliar half-life of a pesticidal active substance on plant surfaces is needed which is valid in combination with a wash-off process. This would mean that a DT_{50} is needed for the substance amount on plant surfaces which is washable by rain or irrigation water.

1. In principal, such a foliar DT_{50} might be evaluated from dislodgeable foliar residue studies. There, the water washable substance amount is measured for several time points after foliar application.
2. A conservative foliar DT_{50} is also evaluable from crop residue decline studies, done on leafy crops. DT_{50} values can be estimated conservatively based on total residues, not only washable residues. There, the total leafy plant above soil surface should be analysed for its residues. However, the total residues in the plant should not be influenced or washed off by rain or irrigation during the evaluated period. Otherwise the decline might be caused by wash-off and not only by foliar dissipation. Finally, such evaluated foliar DT_{50} on total residues are considered as conservative and usable as foliar DT_{50} of washable residues.

Both study types were evaluated in this report to estimate a foliar dissipation DT_{50}.

The kinetic evaluation of the plant residues was conducted using the following approach:
Crop/plant residue decline studies provide time dependent data on total foliar residues. The available studies have been evaluated regarding their validity for wash-off relevant dissipation half-life considering the following criteria:

1. pesticide was applied as formulated product to foliage, not ground;
2. the analysed portion was for the whole plant above ground or the foliage, not just the cropped components (*e.g.*, grains);
3. at least three consecutive data points with at least two of the measurements above level of quantification are available;
4. studies without significant rainfall or water application to leaves are preferred, total rainfall over the evaluated study period should be ≤ 3 mm;
5. Irrigation should be checked as to whether or not it contributes to the rainfall.

From the available residue study and dislodgeable folair residue (DFR) studies where either

prothioconazole or its metabolite, JAU 6476-desthio *(M04)* was included as at least one of the components, 240 reports (covering beans, berries, Brussels sprouts, cabbage, carrots, cauliflower, cereals, cotton, cucumbers, flax, leeks, maize, oat, onions, oil seed rape, papaya, peanuts, peas, potatoes, pulses, rice, soya, sugar beets, sunflower, tomatoes, tulips, turf, and mixtures of the above) could possibly contain useable data. Of these:

- 50 were excluded as they dealt only with seeds or seed treatments, processed materials, or bulbs
- 35 had insufficient data (e.g. just two data points)
- 4 had no indication of any weather data whatsoever
- 4 Australian studies and 43 Brazilian studies were excluded on the basis of climate differences
- 123 reports had > 3 mm rain between sampling times such that the remaining data provided less than three data points. Others had sprinkler irrigation.
- Within the remaining studies, not all data was useable (*e.g.*, in the DFR, all but one of the studies had extensive sprinkler irrigation).

The remaining studies were: [redacted] and [redacted], 2013 (M-468599-01-1); [redacted] and [redacted], 2013 (M-466558-02-1); [redacted], 2007 (M-282998-01-1); [redacted] and [redacted], 2006 (M-275434-01-1); [redacted] et al., 2004 (M-020969-01-1); [redacted] and [redacted], 2008 (M-298110-02-1) and [redacted] and [redacted], 2008 (M-281571-03-1). In many reports, only some of the data could be used, either one of several data sets reported or truncated due to rain events adding to > 3 mm. Irrigation was also a factor. The remaining studies are summarised in KCA 7.1.2.2 /02 to KCA 7.1.2.2 /08.

Four kinetic models, Single First-Order (SFO) and the bi-exponential models FOMC (First-Order Multi-Compartment model), DFOP (double first order parallel) and HS (Hockey-stick) are assumed to adequately describe the degradation of the applied substance in laboratory trials (FOCUS, 2014)

Calculation of DT_{50} / DT_{90} values: A half-life is defined as the time taken for 50% of substance to disappear/dissipate from a compartment following single first-order kinetics, whereas DT_{50} and DT_{90} values are not strictly connected to a first order kinetics. In this report half-lives, DT_{50} and DT_{90} values are calculated from the appropriate rate constant k as $DT_{50} = \ln(2)/k$ and $DT_{90} = \ln(10)/k$, respectively.

II. RESULTS AND DISCUSSION

The results of the fitting procedure for all studied residue trials are summarised as follows. Table 7.1.2.2-7 (SFO curve fit) and Table 7.1.2.2- 8 (DFOP fits) show the results for the analysis where only JAU 6476-desthio *(M04)* data was available (or suitable) for analysis, and Table 7.1.2.2- 9 where a parent-metabolite kinetic analysis was possible.

The fitted DT_{50} values are generally evaluated as valid and visually acceptable, reasonably describing the foliar degradation of prothioconazole in various crops. Statistical evaluation of the results leads to the same conclusion. Occasionally, increased values of scaled error or t-test probability are mostly caused by the limited extent of the data available from individual trials (*e.g.*, Trial A1).

Table 7.1.2.2- 6 (in the Executive Summary) presents the end-points from the trials, which fulfil strictly all acceptance criteria for calculation of a foliar degradation DT_{50} for modelling (< 3 mm of rainfall during evaluation period).

Table 7.1.2.2- 7: DT50 values for JAU 6476-desthio *(M04)* and results of the statistical analysis JAU 6476-desthio assessed alone
(scaled error (Ɛ) and significance of the dissipation rate (t-prob) for **SFO**-model)

Trial code	Trial description (location)	Annex Point / Reference No	Crop	No. of data points	DT50 [days]	χ^2 test	t-test probability
A1	M-468599-01-1 (IT), trial no. 12-2007-03	KCA 7.1.2.2 /02	Maize	3	11.5	10.1	0.08
				Visual:	-	Resids:	+
B2	M-466558-02-1 (BE), trial no. 13-2951-03	KCA 7.1.2.2 /03	Summer rape	3	4.5	1.6	0.046
				Visual:	+	Resids:	+
B3	M-466558-02-1 (NL), trial no. 13-2951-04	KCA 7.1.2.2 /03	Summer rape	3	3.1	6.1	0.118
				Visual:	+	Resids:	+
E	M-275434-01-1 (SP), trial no. R 2005 0023/8	KCA 7.1.2.2 /05	Field pea	4	8.0	9.3	0.015
				Visual:	+	Resids:	+
K	M-298110-02-1 (IT), trial no. R 2007 0425/9	KCA 7.1.2.2 /07	Wheat	4	24.0	9.1	0.044
				Visual:	+	Resids:	+

Table 7.1.2.2- 8: DT50 values for JAU 6476-desthio *(M04)* and results of the statistical analysis JAU 6476-desthio assessed alone
(scaled error (Ɛ) and significance of the dissipation rate (t-prob) for **DFOP**-model)

Trial code	Trial description (location)	Annex Point / Reference No	Crop	No. of data points	DT50[a] [days]	Ɛ [%]	t-prob. (k_2)[a]
J	M-020969-01-1 (FL, USA), trial no. J6043-01W	KCA 7.1.2.2 /06	turf grass	14	7.3	15.1	0.047
				Visual:	++	Resids:	++

a) slow phase of DFOP model

Table 7.1.2.2- 9: DT50 values for JAU 6476-desthio *(M04)* and results of the statistical analysis, parent and metabolite assessed
(scaled error (Ɛ) and significance of the dissipation rate (t-prob) for SFO-model)

Trial code	Trial description (location)	Annex Point / Reference No	Crop	DT50 [days]	Results in:
B1	M-466558-02-1 (UK), trial no. 13-2951-01	KCA 7.1.2.2 /03	summer rape	2.8	Table 7.1.2.2- 10, Table 7.1.2.2- 11
C	M-282998-01-1 (NL), trial no. R 2006 0030/5	KCA 7.1.2.2 /04	onions	4.8	Table 7.1.2.2- 12
P	M-281571-03-1 trial no. JA008-05D	KCA 7.1.2.2 /08	soy bean	1.3	Table 7.1.2.2- 13, Table 7.1.2.2- 14

Table 7.1.2.2- 10: Trial no. B1: DT50 values for prothioconazole and JAU 6476-desthio *(M04)* and results of the statistical evaluation of the model fits using SFO kinetic for foliage of summer rape (n = 9)

Substance	DT50 [days]	DT90 [days]	χ^2 test	t-test probability	Visual acceptability curve	Visual acceptability residues
Prothioconazole	0.48	1.6	12.3	<0.001	+	+
JAU 6476-desthio *(M04)*	2.8	9.4	7.4	<0.001	++	++

other details: M_0 4.3; formation fraction 0.911

Table 7.1.2.2- 11: Trial no. B1: DT_{50} values for prothioconazole and JAU 6476-desthio *(M04)* and results of the statistical evaluation of the model fits using DFOP kinetic (PTZ) for foliage of summer rape (n = 9)

Substance	DT_{50} [days]	DT_{90} [days]	χ^2 test	t-test probability	Visual acceptability curve	Visual acceptability residues
Prothioconazole	1.08 (derived)[a)]		3.3	k_2 <0.001	++	++
JAU 6476-desthio *(M04)*	2.8	9.1	2.8	<0.001	++	++

other details: M_0 4.3; 'g' 0.59634; FFrac: 1.0
a) slow phase of DFOP

Table 7.1.2.2- 12: Trial no. C: DT_{50} values for prothioconazole and JAU 6476-desthio *(M04)* and results of the statistical evaluation of the model fits using SFO kinetic for foliage of onions (n = 4)

Substance	DT_{50} [days]	DT_{90} [days]	χ^2 test	t-test probability	Visual acceptability curve	Visual acceptability residues
Prothioconazole	0.50	1.6	0.85	<0.001	++	+
JAU 6476-desthio *(M04)*	4.8	16.0	8.6	0.005	++	+

other details: M_0 2.65; formation fraction 0.801

Table 7.1.2.2- 13: Trial no. P: DT_{50} values for prothioconazole and JAU 6476-desthio *(M04)* and results of the statistical evaluation of the model fits using SFO kinetic for foliage of soy beans (n = 18)

Substance	DT_{50} [days]	DT_{90} [days]	χ^2 test	t-test probability	Visual acceptability curve	Visual acceptability residues
Prothioconazole	0.52	1.7	10.7	<0.001	+	+
JAU 6476-desthio *(M04)*	1.23	4.1	6.7	<0.001	+	+

other details: M_0 2.65; formation fraction 0.801

Table 7.1.2.2- 14: Trial no. P: DT_{50} values for prothioconazole and JAU 6476-desthio *(M04)* and results of the statistical evaluation of the model fits using DFOP kinetic for foliage of soy beans (n = 18)

Substance	DT_{50} [days]	DT_{90} [days]	χ^2 test	t-test probability	Visual acceptability curve	Visual acceptability residues
Prothioconazole	1.23 (derived)	2.23	2.4	k_2 0.177	++	++
JAU 6476-desthio *(M04)*	1.3	4.3	6.7	<0.001	+	++

other details: M_0 0.058; g 0.65366; FFrac: 0.40

III. CONCLUSIONS

The foliar DT_{50} values for JAU 6476-desthio *(M04)* ranged from 1.3 days to 24.0 days with a geometric mean of 4.0 days. The DT_{50}s are considered suitable as modelling input for wash-off calculations.

Justification for including this study in the Annex I Renewal Dossier: The following residue decline studies are used for degradation properties (foliar DT_{50} for wash-off modeling, summarised in KCA 7.1.2.2 /01).

Report:	**KCA 7.1.2.2 /02; [redacted], J.; [redacted], C.; 2013**
Title:	Determination of the residues of AE C656948 and prothioconazole in/on maize/corn after spray application of AE C656948 & JAU 6476 SE 250 in the field in southern France, Spain, Italy and Portugal
Report No:	12-2007
Document No:	M-468599-01-1
Guidelines:	- EC Guidance working document 7029/VI/95 rev.5 (1997-07-22), - OECD 509 Adopted 2009-09-07, OECD GUIDELINE FOR THE TESTING OF CHEMICALS, Crop Field Trial, - US EPA OCSPP Guideline No. 860.1500
GLP:	Yes
Justification:	Residue decline study used for degradation properties (foliar DT_{50} for wash-off modeling, KCA 7.1.2.2 /01, trial code A1).

Summary

The purpose of the study was to determine the magnitude of the relevant residues of prothioconazole (comprising JAU 6476-desthio. JAU 6476-3-hydroxy-desthio, JAU 6476-4-hydroxy-desthio, JAU 6476-5-hydroxy-desthio, JAU 6476-6-hydroxy-desthio, JAU 6476-alpha-hydroxy-desthio), the triazole derived metabolites (1,2,4-triazole, triazole alanine, triazole acetic acid and triazole lactic acid) and fluopyram (comprising AE C656948 and AE C656948-benzamide) in/on maize/corn (ear without husk, green material, kernel, kernel, immature (milk ripe) and rest of plant) after two spraying applications with AE C656948 & JAU 6476 (SE 250) an SE (Suspo-emulsion) formulation containing 125 g/L prothioconazole and 125 g/L fluopyram. The study included four supersided residue trials conducted in Southern Europe (France, Spain, Italy and Portugal).
Only the data relevant for the kinetic evaluation of several plant residue data of JAU 6476-desthio *(M04)* for refinement of wash-off modelling (KCA 7.1.2.2 /01) are summarised in this Supplemental Dossier. These are the weather details and residue data of JAU 6476-desthio *(M04)* used in the kinetic evaluation KCA 7.1.2.2 /01 with the code no. A1 which are summarised in Table 7.1.2.2- 15 to Table 7.1.2.2- 16.

Table 7.1.2.2- 15: Rainfall data
(first two data points excluded in KCA 7.1.2.2 /01 due to sprinkler irrigation)

Trial no. Country, Weather station	Trial code in KCA 7.1.2.2 /01	Date/ Period of time	Activity	Rainfall [mm]
12-2007-03 Italy, Bologna	A1	2012-06-25	treatment	0
		2012-07-09	treatment, sampling	0
		2012-07-24	sampling	0
		2012-08-01	sampling	0
		2012-08-23	sampling	0
		June 2012		22
		July 2012		1
		August 2012		3

Table 7.1.2.2- 16: Sampling data and residue results, test system: maize/corn

Trial no. Country	Trial code in KCA 7.1.2.2 /01	Sample no.	Growth stage [BBCH]	Days after last treatment	Sample material	JAU 6476-desthio *(M04)* [mg/kg]
12-2007-03 Italy	A1	0029E	69	0	green material	0.46
		0045E	79	15	green material	0.15
		0069E	85	23	green material	0.15

Report:	**KCA 7.1.2.2 /03; [redacted], J.; [redacted], C. M.; 2013**
Title:	Determination of the residues of prothioconazole and tebuconazole in/on rape, summer after spray application of JAU 6476 & HWG 1608 EC 250 in the field in the United Kingdom, Germany, Belgium and the Netherlands
Report No:	13-2951
Document No:	M-466558-02-1
Guidelines:	- EC Guidance working document 7029/VI/95 rev.5 (1997-07-22), - OECD 509 Adopted 2009-09-07, OECD GUIDELINE FOR THE TESTING OF CHEMICALS, Crop Field Trial, - US EPA OCSPP Guideline No. 860.1500
GLP:	Yes
Justification:	Residue decline study used for degradation properties (foliar DT_{50} for wash-off modeling, KCA 7.1.2.2 /01, trial codes B1, B2 and B3)

Summary

The purpose of the study was to determine the magnitude of the relevant residues of prothioconazole (comprising JAU 6476-desthio *(M04)* and prothioconazole) and tebuconazole in/on rape (green material) after one spray application of JAU 6476 & HWG 1608 - EC 250, an EC formulation containing 125 g/L prothioconazole and 125 g/L tebuconazole. The study included four supersided residue trials conducted in Northern Europe (United Kingdom, Germany, Belgium and The Netherlands).

Only the data relevant for the kinetic evaluation of several plant residue data of prothioconazole/ JAU 6476-desthio *(M04)* for refinement of wash-off modelling (KCA 7.1.2.2 /01) are summarised in this Supplemental Dossier. These are the weather details and residue data of prothioconazole and JAU 6476-desthio *(M04)* used in the kinetic evaluation KCA 7.1.2.2 /01 with the code no. **B1, B2** and **B3** which are summarised in Table 7.1.2.2- 17 and Table 7.1.2.2- 18.

Table 7.1.2.2- 17: Rainfall data -no irrigation was conducted

Trial no. Country, weather station	Trial code in KCA 7.1.2.2 /01	Date/ Period of time	Rainfall [mm]
13-2951-01 United Kingdom, [redacted]	B1	2013-06-10	0
		2013-06-11	0
		2013-06-13	1
		2013-06-14	0
		2013-06-17	0
		2013-06-20	0
		June 2013	3
13-2951-03 Belgium, [redacted]	B2	2013-06-04	0
		2013-06-05	0
		2013-06-06	0
		2013-06-07	0
		2013-06-09	0
		2013-06-11	1
		2013-06-13	5
		June 2013	49
13-2951-04 The Netherlands, [redacted]	B3	2013-07-16	0
		2013-07-17	0
		2013-07-18	0
		2013-07-19	0
		2013-07-21	0
		2013-07-23	0
		2013-07-26	2
		July 2013	43

Table 7.1.2.2- 18: Sampling data and residue results, sample material: rape, green material

Trial no. Country	Trial code in KCA 7.1.2.2 /01	Sample no.	Growth stage [BBCH]	Days after last treatment	Prothio-conazole [mg/kg]	JAU 6476-desthio *(M04)* [mg/kg]
13-2951-01 United Kingdom	B1	0010E	30	0	3.2	1.1
		0011E	30	1	0.94	2.8
		0012E	31	2	0.54	2.4
		0013E	32	3	0.21	2.1
		0014E	31	4	0.11	1.7
		0015E	50	7	0.036	0.96
		0016E	52	10	0.018	0.48
13-2951-03 Belgium	B2	0010E	30	0	2.7	2.0
		0011E	30	1	0.56	2.3
		0012E	31	2	0.21	1.9
		0013E	32	3	0.13	1.7
		0014E	39	5	0.073	1.1
		0015E	51	7	0.050	0.72
		0016E	53	9	0.026	0.42
13-2951-04 The Netherlands	B3	0010E	30	0	2.1	2.1
		0011E	31	1	0.55	3.0
		0012E	51	2	0.19	2.1
		0013E	52	3	0.12	2.0
		0014E	55	5	0.070	1.3
		0015E	60	7	0.043	0.94
		0016E	61	10	0.018	0.47

Report:	**KCA 7.1.2.2 /04; [redacted], T.; 2007**
Title:	Determination of the residues of fluoxastrobin and JAU 6476 in/on onion after spraying of HEC 5725 & JAU 6476 (200 EC) in the field in Belgium, Germany, Northern France and Netherlands
Report No:	RA-2108/06
Document No:	M-282998-01-1
Guidelines:	EU-Ref: Council Directive 91/414/EEC of July 15, 1991, Annex II, part A, section 6 and Annex III, part A, section 8 Residues in or on Treated Products, Food and Feed
GLP:	Yes
Justification:	Residue decline study used for degradation properties (foliar DT_{50} for wash-off modeling, KCA 7.1.2.2 /01, trial code C)

Summary

The purpose of the study was to determine the magnitude of the relevant residues of prothioconazole, JAU 6476-desthio and fluoxastrobin in/on onion bulb and leaves harvested after four spray applications with HEC 5725 & JAU 6476 (EC 200) on onion plants in Northern Europe (Belgium, Germany, Northern France, and Netherlands).

Only the data relevant for the kinetic evaluation of several plant residue data of prothioconazole and JAU 6476-desthio *(M04)* for refinement of wash-off modelling (KCA 7.1.2.2 /01) are summarised in this Supplemental Dossier. These are the weather details and residue data of prothioconazole and JAU 6476-desthio *(M04)* used in the kinetic evaluation KCA 7.1.2.2 /01 with the code no. **C** which are summarised in Table 7.1.2.2- 19 and Table 7.1.2.2- 20. All 4 data points valid for kinetic analysis,

considering parent and metabolite. The data of JAU 6476-desthio are corrected to parent equivalents prior to kinetics.

Table 7.1.2.2- 19: Rainfall and temperature data

Trial no. Country, weather station	Trial code in KCA 7.1.2.2 /01	Date/ Period of time	Rainfall [mm]
R 2006 0030/5 The Netherlands, [redacted]	C	2006-06-26	55
		2006-07-01	0
		2006-07-06	0
		2006-07-11	1
		2006-07-14	0
		2006-07-18	0
		2006-07-25	0
		2006-08-01	0
		2006-06-01 - 2006-06-30	90
		2006-07-01 - 2006-07-31	4

Table 7.1.2.2- 20: Sampling data and residue results, test system: onions

Trial no. Country	Trial code in KCA 7.1.2.2 /01	Sample no.	Growth stage [BBCH]	Days after last treatment	Sample material	Prothio-conazole [mg/kg]	JAU 6476-desthio *(M04)* [mg/kg]
R 2006 0030/5 The Netherlands	C	UP0012	47	0	leaf, normal	0.66	1.8
		UP0016	47	3	leaf, normal	0.04	1.4
		UP0020	48	7	leaf, normal	0.01	0.69
		UP0028	48	14	leaf, normal	0.01	0.38

Report:	**KCA 7.1.2.2 /05; [redacted], T.; [redacted], K.; 2006**
Title:	Determination of the residues of SXX 0665 and tebuconazole in/on field pea after spraying of HWG 1608 & JAU 6476 (250 EC) in the field in Southern France, Spain, Italy and Greece
Report No:	RA-2567/05
Document No:	M-275434-01-1
Guidelines:	91/414/EEC
GLP:	Yes
Justification:	Residue decline study used for degradation properties (foliar DT_{50} for wash-off modeling, KCA 7.1.2.2 /01, trial code E)

Summary

The purpose of the presented study was to determine the magnitude of residues of prothioconazole, JAU 6476-desthio *(M04)* and tebuconazole in/on field pea (pod and seed, dry) harvested after two spray applications with HWG 1608 & JAU 6476 (250 EC) in Southern Europe (Southern France, Spain, Italy and Greece).
Only the data relevant for the kinetic evaluation of several plant residue data of JAU 6476-desthio *(M04)* for refinement of wash-off modelling (KCA 7.1.2.2 /01) are summarised in this Supplemental Dossier. These are the weather details and residue data of JAU 6476-desthio *(M04)* used in the kinetic evaluation KCA 7.1.2.2 /01 with the code no. **E** which are summarised in Table 7.1.2.2- 21 and Table 7.1.2.2- 22. All 4 data points valid for kinetic analysis, considering parent and metabolite. The data of JAU 6476-desthio are corrected to parent equivalents prior to kinetics.

Table 7.1.2.2- 21: Rainfall and temperature data

Trial no. Country, weather station	Trial code in KCA 7.1.2.2 /01	Date/ Period of time	Rainfall [mm]
R 2005 0023/8 Spain, [redacted]	E	2005-06-17	0
		2005-06-22	36
		2005-06-29	36
		2005-07-06	36
		2005-07-07	0
		2005-07-13	36
		2005-07-13	0
		2005-07-20	36
		2005-07-20	0
		2005-07-27	36
		2005-08-03	36
		2005-08-05	0

Table 7.1.2.2- 22: Sampling data and residue results, test system: field peas

Trial no. Country	Trial code in KCA 7.1.2.2 /01	Sample no.	Growth stage [BBCH]	Days after last treatment	Sample material	Prothio-conazole [mg/kg]	JAU 6476-desthio *(M04)* [mg/kg]
R 2005 0023/8 Spain	E	UP0007	69	0	green material	2.0	1.1
		UP0009	75	6	green material	0.05	0.76
		UP0011	79	13	green material	< 0.05	0.34

a) before last treatment

Report:	**KCA 7.1.2.2 /06; [redacted], A. T.; [redacted], F. K.; [redacted], S. T.; 2004**
Title:	JAU 6476 480 SC - Magnitude of residue in/on turf grass, a potential wildlife feed item
Report No:	200832
Document No:	M-020969-01-1
Guidelines:	US EPA 40 CFR part 160
GLP:	Yes
Justification:	Residue decline study used for degradation properties (foliar DT_{50} for wash-off modeling, KCA 7.1.2.2 /01, trial code J)

Summary

The purpose of the presented study was to determine the magnitude of residues of prothioconazole and JAU 6476-desthio *(M04)* in/on turf grass after a single spray application with JAU 6476 (480 SC) in Florida, USA.

Only the data relevant for the kinetic evaluation of several plant residue data of JAU 6476-desthio *(M04)* for refinement of wash-off modelling (KCA 7.1.2.2 /01) are summarised in this Supplemental Dossier. These are the weather details and residue data of JAU 6476-desthio *(M04)* used in the kinetic evaluation KCA 7.1.2.2 /01 with the code no. **J** which are summarised in Table 7.1.2.2- 23 and Table 7.1.2.2- 24. The first three (paired data points are valid for kinetic analysis, considering just the metabolite JAU 6476-desthio.

Table 7.1.2.2- 23: Rainfall and temperature data

Trial no. Country, State	Trial code in KCA 7.1.2.2 /01	Date/ Period of time	Precipitation [mm]
J6043-01W USA, Florida	J	2001-10-05	0
		2001-10-14	0.09
		2001-10-19	0.01
		2001-10-21	0.07
		2001-10-25	0.11
		2001-11-02	0.41
		total	0.69

Table 7.1.2.2- 24: Residue data, test system: turf

Trial no. Country	Trial code in KCA 7.1.2.2 /01	Study day	Prothioconazole [mg/kg]		mean
J6043-01W USA, Florida	J	0	16.903	18.354	17.629
		1	10.392	12.442	11.417
		3	4.041	3.536	3.788
		7	4.255	4.442	4.349
		14	1.359	1.339	1.349
		21	0.186	0.252	0.219
		28	0.109	0.120	0.115

Report:	**KCA 7.1.2.2 /07; [redacted], R.; [redacted], S.; 2008**
Title:	Determination of the residues of BYF 00587 and JAU 6476 in/on winter wheat and wheat, durum after spraying of BYF 00587 & JAU 6476 (225 EC) in the field in Southern France, Spain, Portugal and Italy
Report No:	RA-2038/07
Document No:	M-298110-02-1
Guidelines:	- EU-Ref: Council Directive 91/414/EEC of July 15, 1991, Annex II, part A, section 6 and Annex III, part A, section 8 - EC guidance working document 7029/VI/95 rev. 5 (1997-07-22)
GLP:	Yes
Justification:	Residue decline study used for degradation properties (foliar DT_{50} for wash-off modeling, KCA 7.1.2.2 /01, trial code K)

Summary

The purpose of the presented study was to determine the magnitude of residues of BYF 00587, its metabolite BYF00587-desmethyl and JAU 6476-desthio *(M04)* in/on wheat green material, ear, rest of plant, grain and straw harvested after two spray applications withBYF 00587 & JAU 6476 (225 EC) on wheat in Southern Europe (France, Spain,Portugal and Italy).
Only the data relevant for the kinetic evaluation of several plant residue data of JAU 6476-desthio *(M04)* for refinement of wash-off modelling (KCA 7.1.2.2 /01) are summarised in this Supplemental Dossier. These are the weather details and residue data of JAU 6476-desthio *(M04)* used in the kinetic evaluation KCA 7.1.2.2 /01 with the code no. **K** which are summarised in Table 7.1.2.2- 25 and Table 7.1.2.2- 26.

Table 7.1.2.2- 25: Rainfall and temperature data

Trial no. Country, Trial location	Trial code in KCA 7.1.2.2 /01	Date/ Period of time	Rainfall [mm]
R 2007 0425/9 Italy, Sicilia	K	2007-04-12	0
		2007-04-26	0
		2007-05-03	0
		2007-05-10	0
		2007-05-24	0
		2007-05-31	0
		2007-06-18	01
		2007-04-01 - 2007-04-30	-
		2007-05-01 - 2007-05-31	-
		2007-06-01 - 2007-06-30	-

Table 7.1.2.2- 26: Sampling data and residue results, test system: wheat

Trial no. Country	Trial code in KCA 7.1.2.2 /01	Sample no.	Growth stage [BBCH]	Days after last treatment	Sample material	JAU 6476-desthio *(M04)* [mg/kg]
R 2007 0425/9 Italy	K	UP0003	69	0	green material	2.7
		UP0004	69	7	green material	2.2
		UP0005	71	14	green material	1.4
		UP0006	83	28	green material	1.4

Report:	**KCA 7.1.2.2 /08; [redacted], M. E.; [redacted], E. C.; 2006, rev. 2008**
Title:	JAU6476 480 SC - Dislodgeable foliar residue on various crops
Report No:	RAJAY028-1
Document No:	M-281571-03-1
Guidelines:	Series 875, Part B: Dislodgeable Residue Dissipation: Agriculture Guideline
GLP:	No
Justification:	Residue decline study used for degradation properties (foliar DT_{50} for wash-off modeling, KCA 7.1.2.2 /01, trial code P)

Summary

Seven field trials (two peanut, two pulse (dry bean), two soybean, and one sugarbeet) were conducted to determine the amount of prothioconazole and the metabolite JAU 6476-desthio *(M04)* residue that can be dislodged from peanut, pulse, soybean, and sugarbeet foliage following foliar application of JAU 6476 480 SC. The soybean trials which are used for the kinetic evaluation KCA 7.1.2.2 /01 were conducted in Nebraska.

Only the data relevant for the kinetic evaluation of prothioconazole and JAU 6476-desthio *(M04)* for refinement of wash-off modelling (KCA 7.1.2.2 /01) are summarised in this Supplemental Dossier. These are the weather details and residue data of of prothioconazole and JAU 6476-desthio *(M04)* used in the kinetic evaluation KCA 7.1.2.2 /01 with the code no. **P** which are summarised in Table 7.1.2.2-27 and Table 7.1.2.2- 28.

Table 7.1.2.2- 27: Rainfall and temperature data

Trial no. Country, State	Trial code in KCA 7.1.2.2 /01	Date/ Period of time	Precipitation [inches]	Precipitation [mm]
JA008-05D USA, Nebraska	P	2005-07-27	0.51	13.0
		2005-08-03	0.02	0.5
		2005-08-11	0.93	23.6
		2005-08-12	0.43	10.9
		2005-08-20	0.02	0.5
		2005-08-26	0.20	5.1
		2005-08-29	0.30	7.6
		2005-09-07	0.03	0.8
		2005-09-14	0.53	13.5
		total	2.97	75.4

Table 7.1.2.2- 28: Sampling data and residue results, test system: soybean trial code in KCA 7.1.2.2 /01: P

Trial no. Country	Sampling interval [days][a)]	Corrected prothioconazole[b)] [µg/cm²]			Corrected JAU 6476-desthio[b)] [µg/cm²]			Total[c)] corrected[b)] [µg/cm²]		
JA008-05D USA	1	0.0097	0.0107	0.0142	0.0101	0.0109	0.0163	0.0198	0.0216	0.0305
	2	0.0058	0.0077	0.0060	0.0080	0.0112	0.0095	0.0138	0.0189	0.0155
	3	0.0040	< LOD	< LOD	0.0083	< LOD	0.0073	0.0123	< LOD	0.0090
	5	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	7	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	10	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	14	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	21	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	28	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	35	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD

a) days after 3rd treatment
b) the measured prothioconazole and JAU 6476-desthio residues were corrected to 100% recovery using the average recovery of the field recovery samples which were shipped with the samples and analysed in the same sample set as the samples
c) sum of prothioconazole and JAU 6476-desthio (in parent equivalents)

CA 7.1.2.2.1 Soil dissipation studies

The dissipation and degradation of prothioconazole in soil under field conditions were evaluated during the Annex I inclusion using unlabelled prothioconazole formulated as EC 250, and were accepted by the European Commission (EFSA Scientific Report (2007) 106, 1-98, 12 July 2007). The following studies and the corresponding kinetic evaluation are included in the Baseline Dossier:

Annex Point / Reference No	Author(s)	Year	Study type	Document No
KCA 7.1.2.2.1 /01	[redacted], O.	2001	terrestrial field dissipation	M-049322-01-1
KCA 7.1.2.2.1 /02	[redacted], O.	2001	storage stability	M-049685-01-1
KCA 7.1.2.2.1 /03	[redacted], T.	2001	kinetic evaluation	M-075316-01-1

One additional study on the determination of the storage stability of prothioconazole and its major soil metabolite sin soil is submitted within this Supplemental Dossier for the prothioconazole renewal of approval. This study is summarised under KCA 7.1.2.2.1 /04. As this study is a follow-up of the storage stability study submitted within the Baseline Dossier (KCA 7.1.2.1.2 /02) the corresponding summary of this study as given in the Baseline Dossier is also **not** repeated within this Supplemental Dossier.

In addition, updated kinetic evaluations of the degradation behaviour of prothioconazole and its major soil metabolites JAU 6476-desthio *(M04)* in soil under field conditions have been performed according to EFSA Guidance (2014) and FOCUS Guidance (2006 and 2014) to derive kinetic parameters suitable for environmental risk assessment and modelling purpose. They are summarised under KCA 7.1.2.2.1 /05, KCA 7.1.2.2.1 /06 and KCA 7.1.2.2.1 /07.
As new kinetic evaluations of the terrestrial field dissipation trials have been performed the summaries of the soil dissipation study (KCA 7.1.2.2.1 /01) and the corresponding former kinetic evaluation (KCA 7.1.2.2.1 /03) as given in the Baseline Dossier are **not** repeated within this Supplemental Dossier.
A summary of the degradation rates of prothioconazole and its major degradation products in soil in the field is given in section CA 7.1.2.2.

Storage stability in soil

New study submitted for Annex I renewal
Justification for including this study in the Annex I Renewal Dossier: The objective of this study is the determination of the storage stability of prothioconazole and its metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* in soil up to a storage period of 770 days in addition to the study of [redacted], 2001 (KCA 7.1.2.2.1 /02, included in the Baseline Dossier) which includes information on storage stability up to day 420.

Report:	**KCA 7.1.2.2.1 /04; [redacted], H.; 2002**
Title:	Determination of the storage stability of JAU 6476 and of the metabolites JAU 6476-desthio and JAU 6476-S-methyl in soil
Report No:	MR-081/02
Document No:	M-055055-01-1
Guidelines:	EU Council Directive 91/414/EEC amended by the Commission directive 96/46/EC
GLP:	Yes
Justification:	additional information on storage stability up to a storage period of 770 days

Executive Summary
The purpose of this study was to determine the storage stability of prothioconazole and of its metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* and in soil up to a storage period of 770 days.

Untreated soil samples of soil Hoefchen (GER) were fortified with prothioconazole, JAU 6476-S-methyl *(M01)* or JAU 6476-desthio *(M04)*. The fortified concentrations of prothioconazole, JAU 6476-S-methyl and JAU 6476-desthio were about 50 µg/kg.

The mean recovery was 94.9% for prothioconazole, 101% for JAU 6476-S-methyl and 102% for JAU 6476-desthio.
Prothioconazole, JAU 6476-S-methyl and JAU 6476-desthio are stable under deep-frozen conditions for at least 770 days. Degradation of prothioconazole could be observed only at room temperature, but no further degradation was seen under frozen conditions.
However, prior to freezing and during extraction, losses of prothioconazole (bound residues, etc.) occurred of around 50%.
The overall recovered amounts were 33.4% for prothioconazole, 98.6% for JAU 6476-S-methyl 95.1% for JAU 6476-desthio.
Results obtained after a storage period of 770 days were very close to the results obtained from samples extracted on day 0. The relative differences between recovered amounts on day 0 and after storage for 770 days were between -0.3% and -7.4% for the analysed substances prothioconazole, JAU 6476-S-methyl and JAU 6476-desthio. The recovered amounts of prothioconazole JAU 6476-S-methyl and JAU 6476-desthio on day 0 and after a storage period of 770 days are listed in Table 7.1.2.2.1- 1.

Table 7.1.2.2.1- 1: Recovered amounts after a storage period of 770 days

Recovered amounts after storage for	Prothioconazole [%][a)]	JAU 6476-S-methyl *(M01)* [%]	JAU 6476-desthio *(M04)* [%]
0 days (= days + 3 h)	35.5	102	101
770 days	35.2	99.2	93.6
Relative difference [%]	-0.3	-2.8	-7.4

a) For all storage stability samples, the time between spiking of the soil samples and deep freezing was about the same (3 h + 30 min). Therefore, the day 0 + 3 h sample set was used for prothioconazole in this table

I. MATERIALS AND METHODS

A. MATERIALS

1. Test Items

unlabelled prothioconazole

Reference numbers:	M00175	M00729
Purities:	99.9%	99.4%

unlabelled JAU 6476-S-methyl *(M01)*

Reference number:	M00892
Purity:	99.0%

unlabelled JAU 6476-desthio *(M04)*

Reference numbers:	881201ELB02	M01305
Purities:	99.8%	99.6%

Isotopically labelled internal standards were used to compensate for possible matrix effects in the MS/MS detector:

JAU 6476-triazole-^{15}N, ^{13}C
Reference numbers: M08676 K-1098
Purities: 99.0% 99.3%

JAU 6476-S-methyl-d_3, ^{13}C
Reference number: M08677
Purity: 99.0%

JAU 6476-desthio-triazole-^{15}N, ^{13}C
Reference number: M08682
Purity: 98%

2. Test Soil

[redacted] (Germany) was used for this storage stability study. The soil was classified according to DIN and USDA specifications. Soil parameters are summarised in Table 7.1.2.2.1- 2.

Table 7.1.2.2.1- 2: Physical-chemical properties of the test soil

Parameter	Results / Units
Soil designation	[redacted]
Geographic location (Country)	Germany
Textural class (USDA): sand [%] silt [%] clay [%]	silt loam 5.4 75.9 18.7
pH (soil/$CaCl_2$)	6.7
Organic carbon [%] Organic matter [%]	0.91 1.57
Cation exchange capacity [meq/100 g]	13
Water holding capacity maximum [g H_2O *ad* 100 g soil DW[a)]]	90

a) DW = dry weight

B. STUDY DESIGN

1. Experimental conditions

The test system for storage stability in soil under frozen conditions consisted of polypropylene screw cap bottles (volume 60 mL). For preparation of the test systems, 20 g of the soils were weighed into each tube.
Fortification concentrations of nominal 50 µg per kg soil were used for each test item.

After application, the test systems were stored at -18°C and -25°C in a deep-freezer for up to 770 days.

2. Sampling

Soil samples were analysed on day 0 and after 3, 7, 180, 420, 552 and 770 days of storage between -18 and -25°C. Additionally, to obtain a more detailed understanding of the behaviour of prothioconazole under storage conditions, three sets of samples were spiked with the parent compound and were analysed after 1, 3 and 15 hours of storage time at ambient temperature.

At each sampling interval one control sample and four treated soil samples were analysed. A second control sample was used for determination of concurrent recoveries.

3. Analytical procedures

The analytical method 00610 (M-041798-01-1, included in the Baseline Dossier, KCA 4.1.2) was developed for the determination of prothioconazole and its degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* in soil.
Soil samples of 20 g were extracted with 100 mL of a mixture of acetonitrile/water/cysteine hydrochloride monohydrate on a mechanical shaker for 60 minutes and filtered. 35 mL of the filtered solution was transferred into a 50-mL volumetric flask, into which 125 µL of the internal standard solution had been added. The flask was made up to volume with water. Identification and quantification of the active substance and of the metabolites were done by high performance liquid chromatography using MS/MS-detection in the Multiple Reaction Monitoring mode. Isotopically labelled internal standards (prothioconazole-triazole-^{15}N, ^{13}C, JAU 6476-S-methyl-d_3, ^{13}C and JAU 6476-desthio-triazole-^{15}N, ^{13}C) were used to compensate for possible matrix effects in the MS/MS-detector.
The mean recovery was 94.9% for prothioconazole, 101% for JAU 6476-S-methyl and 102% for JAU 6476-desthio.
The mean recoveries of the method validations conducted during the storage stability study were 99.5% for prothioconazole, 99.2% for JAU 6476-S-methyl and 100% for JAU 6476-desthio.
The mean concurrent recoveries during analysis of the samples was 98.9% for prothioconazole, 92.4% for JAU 6476-S-methyl and 94.1% for JAU 6476-desthio.

The limit of quantification (LOQ) of the method was 6 µg/kg for prothioconazole and the metabolites JAU 6476-S-methyl and JAU 6476-desthio and. The limit of detection (LOD) was 2 µg/kg for prothioconazole and its metabolites.

II. RESULTS AND DISCUSSION

A. DATA

The overall recovered amounts were 33.4% for prothioconazole (RSD = 11.5%), 98.6% for JAU 6476-S-methyl (RSD = 5.2%) and 95.4% for JAU 6476-desthio (RSD = 6.0%). The recovered amounts are summarised in Table 7.1.2.2.1- 3 to Table 7.1.2.2.1- 5.
To obtain a more detailed understanding of the behaviour of prothioconazole under storage conditions, three additional sets of four samples each were spiked with the parent compound and analysed after 1, 3 and 15 hours of storage at ambient temperature. The results are presented in Table 7.1.2.2.1- 6. Prothioconazole was only stable in frozen soil (< -18°C). At ambient temperature, a part of the active substance dissipated quickly to JAU 6476-desthio and to traces of JAU 6476-S-methyl. The amounts that could be recovered from soil depended on the time between spiking of the soil samples and deep-freezing. The longer the samples were stored at room temperature, the lower were the recovered amounts of prothioconazole and the higher were the recovered amounts of JAU 6476-desthio and JAU 6476-S-methyl. The storage stability samples were all treated in the same way, i.e. the time between spiking of the soil samples and deep-freezing was about the same for all samples (3 h ± 30 min). In those frozen soil samples, no further degradation of prothioconazole could be observed for at least 770 days (see Table 7.1.2.2.1- 3).

Table 7.1.2.2.1- 3: Recovered amounts of prothioconazole in percent of applied amount

DAT [day]	Recovered amounts, single values [%]				Recovered amounts, mean values [%]	RSD [%]
0[a)]	116	106	116	114	113	4.2
0 + 3h[b)]	37.6	38.7	30.8	35.0	35.5	9.9
3	31.9	27.5	23.0	31.7	28.5	14.7
7	33.6	26.7	28.9	31.8	30.3	10.1
180	39.4	36.1	37.3	37.6	37.6	3.6
420	33.7	30.7	35.3	31.7	32.9	6.3
552	33.4	33.0	35.1	33.4	33.7	2.8
770	32.6	34.9	38.7	34.7	35.2	7.2
overall mean and RSD[c)]					**33.4**	**11.5**

a) on day 0, the fortification standards were spiked into the extraction solvent and not onto the soil samples. Therefore, the mean recovery rate was around 100% and no metabolites were formed.
b) day 0 + 3h samples storage 3h under ambient temperature
c) without day 0 samples

Table 7.1.2.2.1- 4: Recovered amounts of JAU 6476-S-methyl *(M01)* in percent of applied amount

DAT [day]	Recovered amounts, single values [%]				Recovered amounts, mean values [%]	RSD [%]
0	102	101	103	103	102	0.9
3	102	101	103	97.4	101	2.4
7	82.5	90.3	88.0	91.3	88.0	4.5
180	102	101	104	102	102	1.2
420	101	99.9	96.1	95.4	98.1	2.8
552	98.5	101	99.5	99.2	99.6	1.1
770	102	95.4	99.5	99.9	99.2	2.8
overall mean and RSD					**98.6**	**11.5**

Table 7.1.2.2.1- 5: Recovered amounts of JAU 6476-desthio *(M04)* in percent of applied amount

DAT [day]	Recovered amounts, single values [%]				Recovered amounts, mean values [%]	RSD [%]
0	103	101	102	99.8	101	1.4
3	95.6	98.2	98.2	100	98.0	1.8
7	82.6	85.3	83.3	81.4	83.2	2.0
180	98.6	98.9	98.3	96.7	98.1	1.0
420	93.9	96.8	96.5	100	96.8	2.6
552	94.6	95.0	94.5	94.8	94.7	0.2
770	94.8	90.6	90.6	95.7	93.6	2.4
overall mean and RSD					**95.1**	**6.0**

Table 7.1.2.2.1- 6: Behaviour of prothioconazole at storage in ambient conditions

Day	Recovered amounts in % of			Total recovered amounts [%]
	Prothioconazole	JAU 6476-S-methyl *(M01)*	JAU 6476-desthio *(M04)*	
0 + 1 h	41.0	n.d.	17.9	58.9
0 + 3h	35.5	n.d.	22.2	57.7
0 + 15h	18.3	< LOD	29.5	47.8

< LOQ: concentrations of JAU 6476-S-methyl below the limit of quantification of 6µg/kg
n.d.: concentrations of JAU 6476-S-methyl below the limit of detection of 2µg/kg

III. CONCLUSIONS

Prothioconazole, JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* are stable under deep-frozen conditions for at least 770 days. Degradation of prothioconazole could only be observed at room temperature; no further degradation was seen under frozen conditions. However, prior to the freezing procedure and during the extraction procedure losses of prothioconazole (bound residues, etc.) of up to around 50% occurred.

Kinetic evaluation for <u>trigger</u> endpoints

New kinetic evaluation submitted for Annex I renewal
Justification for including this study in the Annex I Renewal Dossier: The objective of this study is to estimate dissipation times (DT_{50}) of prothioconazole and its major degradation product JAU 6476-desthio *(M04)* at study conditions (KCA 7.1.2.2.1 /01, included in the Baseline Dossier) for use as <u>trigger</u> endpoint. The evaluation was conducted to derive kinetic parameters according to FOCUS Guidance 2014).

Report:	**KCA 7.1.2.2.1 /05; [redacted], A.C.; [redacted], C.; 2015**
Title:	Prothioconazole (PTZ) kinetics aerobic soil field - Kinetic evaluation (trigger endpoints) of the soil dissipation of desthio (metabolite of prothiconazole) under field conditions
Report No:	EnSa-15-0285
Document No:	M-535848-01-1
Guidelines:	FOCUS, 2014: Generic guidance for Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration, Version: 1.1; Date: 18 December 2014
GLP:	No (calculation)
Justification:	New data / guideline requirement: Kinetic analysis of the degradation of prothioconazole and its major degradation product JAU 6476-desthio *(M04)* for trigger endpoints

Executive Summary
The purpose of this study was to estimate dissipation times (DT_{50}) at study conditions for use as <u>trigger</u> endpoint. The dissipation of prothioconazole and the metabolite JAU 6476-desthio in agricultural soils under natural field conditions was investigated in eight trials in Europe ([redacted], 2001, KCA 7.1.2.2.1 /01, included in the Baseline Dossier). The kinetic evaluation was performed according to the guidance given by the FOCUS Kinetics report (FOCUS, 2014). Degradation parameters were fitted with the software KinGUI 2.1.
Four kinetic models, Single First-Order (SFO) and the bi-exponential models FOMC (First-Order Multi-Compartment model), DFOP (double first order parallel) and HS (Hockey-stick) are assumed to

adequately describe the dissipation of the applied substance in field trials (FOCUS, 2014).

The DT_{50} values for prothioconazole and JAU 6476-desthio *(M04)* are shown in the tables below. DT_{50} values (trigger endpoints) ranged from 1.2 days to 1.6 days for prothioconazole and from 16.2 days to 63.4 days for JAU 6476-desthio. The kinetic parameters determined for the dissipation under realistic field conditions are considered appropriate as trigger endpoints.

Table 7.1.2.2.1- 7: Trigger endpoints (field DT_{50}) of prothioconazole, non-normalised

Study	Annex Point / Reference No	Location	Kinetic type[a)]	DT_{50} [days]	DT_{90} [days]
[redacted] (2001)	KCA 7.1.2.2.1 /01	R812587 (Germany)	SFO	1.6	5.2
		R812595 (Great Britain)	Fit not acceptable	--	--
		R812609 (France, North)	SFO	1.2	3.9
		R812617 (Great Britain)	Fit not acceptable	--	--
		R812625 (France, North)	SFO	1.2	3.9
		R812633 (France, South)	SFO	1.4	4.6
		R815667 (Italy)	SFO	1.4	4.6
		R815675 (Germany)	SFO	1.5	4.9
Geometric mean				**1.4**	

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

Table 7.1.2.2.1- 8: Trigger endpoints (field DT_{50}) of JAU 6476-desthio *(M04)*, non-normalised

Study	Annex Point / Reference No	Location	Kinetic type[a)]	DT_{50} [days]	DT_{90} [days]
[redacted] (2001)	KCA 7.1.2.2.1 /01	R812587 (Germany)	SFO	16.2	53.9
		R812595 (Great Britain)	SFO	50.9	169
		R812609 (France, North)	SFO	55.6	185
		R812617 (Great Britain)	SFO	49.3	164
		R812625 (France, North)	SFO	48.4	161
		R812633 (France, South)	SFO	63.4	211
		R815667 (Italy)	SFO	32.2	107
		R815675 (Germany)	SFO	27.0	90
Geometric mean				**39.6**	

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

I. METHODS

The behaviour of prothioconazole under field conditions was investigated in one terrestrial field soil dissipation study, encompassing eight trial sites located throughout Europe (France, Germany, Italy and UK, [redacted], 2001). All trials were considered in the evaluation (Baseline Dossier, KCA 7.1.2.2.1 /01) were used. The field dissipation trials were carried out at eight sites across Europe in order to cover different representative agro-climatic regions. Each test site received a single application at a nominal application rate of the active substance of 200 g/ha. Application was made on bare soil. At 4 trials, the soil was maintained bare; at the other 4 trials spring barley was sown at the day of application or a few days before.
The kinetic analysis was performed according to FOCUS kinetics (2014) using the software KinGUI 2 with four different kinetic models: Single First-Order (SFO) and the bi-exponential models FOMC (First-Order Multi-Compartment model), DFOP (double first order parallel) and HS (Hockey-stick).

Calculation of DT_{50} / DT_{90} values: A half-life is defined as the time taken for 50% of substance to

disappear/dissipate from a compartment following single first-order kinetics, whereas DT_{50} and DT_{90} values are not strictly connected to a first order kinetics. In this report half-lives, DT_{50} and DT_{90} values are calculated from the appropriate rate constant k as $DT_{50} = \ln(2)/k$ and $DT_{90} = \ln(10)/k$, respectively. For trigger endpoints, all residue data beginning from DAT 0 are used and the day length is not normalised to standard conditions.

II. RESULTS AND DISCUSSION

Trigger endpoints for prothioconazole and JAU 6476-desthio *(M04)* were derived following the procedure described in FOCUS (2014). An overview of the trigger endpoints is given in Table 7.1.2.2.1-7and Table 7.1.2.2.1- 8. in the Executive Summary. The trigger endpoints and statistical parameters for prothioconazole and JAU 6476-desthio are given in Table 7.1.2.2.1- 9 and Table 7.1.2.2.1- 10.

Table 7.1.2.2.1- 9: Trigger endpoints (field DT_{50}) and statistical parameters of prothioconazole
(prothioconazole only)
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
R812587 - [redacted] (Germany)[c)]						
SFO	M_0: 115 k: 0.443	1.26	k: 0.001	+	**1.6**	5.2
► SFO fit statistically and visually good; FOMC cannot be fitted due to the low number of measurement dates. ► **Conclusion**: Prothioconazole is well described using SFO kinetics						
R812595 - [redacted] (Great Britain)[c)]						
SFO	M_0: 123 k: 0.489	1.20	k: 0.126	+	**1.4**	4.7
► SFO fit statistically not acceptable (t-test for k); FOMC cannot be fitted due to the low number of measurement dates . ► **Conclusion**: Do not use the endpoints of this trial. However, since the fit is visually acceptable, SFO of prothioconazole may be used to fit the metabolite in the next step.						
R812609 – [redacted] (France North)[c)]						
SFO	M_0: 142 k: 0.595	4.47	k: 0.006	o	**1.2**	3.9
FOMC	M_0: 142 α: 0.307 β: 6.56×10^{-5}	2.42	-	-	0.00056	0.12
► SFO fit statistically and visually good and better than FOMC; FOMC not acceptable. ► **Conclusion**: Prothioconazole is well described using SFO kinetics						
R812617 - [redacted] (Great Britain)[d)]						
SFO	M_0: 117 k: 0.389	1.22	k: 0.130	+	**1.8**	5.9
► SFO fit statistically not acceptable (t-test for k); FOMC cannot be fitted due to the low number of measurement dates ► **Conclusion**: Do not use the endpoints of this trial. However, since the fit is visually acceptable, SFO of prothioconazole may be used to fit the metabolite in the next step.						
R812625 – [redacted] (France North)[d)]						
SFO	M_0: 140 k: 0.592	1.06	k: 0.051	+	**1.2**	3.9
► SFO fit statistically and visually good; FOMC cannot be fitted due to the low number of measurement dates. ► **Conclusion**: Prothioconazole is well described using SFO kinetics						
R812633 – [redacted] (France South)[d)]						
SFO	M_0: 79.4 k: 0.498	1.82	k: 0.011	+	**1.4**	4.6
► SFO fit statistically and visually good; FOMC cannot be fitted due to the low number of measurement dates. ► **Conclusion**: Prothioconazole is well described using SFO kinetics						
R815667 – [redacted] (Italy)[d)]						
SFO	M_0: 80.6 k: 0.501	1.79	k: 0.077	+	**1.4**	4.6
► SFO fit statistically and visually good; FOMC cannot be fitted due to the low number of measurement dates ► **Conclusion**: Prothioconazole is well described using SFO kinetics						
R815675 – [redacted] (Germany)[c)]						
SFO	M_0: 105 k: 0.467	1.39	k: 0.029	+	**1.5**	4.9
► SFO fit statistically and visually good; FOMC cannot be fitted due to the low number of measurement dates ► **Conclusion**: Prothioconazole is well described using SFO kinetics						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor
c) bare soil
d) cropped with spring barley in the first and grass in the second year

Table 7.1.2.2.1- 10: Trigger endpoints (field DT_{50}) and statistical parameters of JAU 6476-desthio *(M04)* (best fits highlighted in **bold letters**)

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
R812587 - [redacted] (Germany)[c)]						
Fit together with prothioconazole						
SFO	k: 0.0427 ff: 0.646	8.97	k: < 0.001 ff: < 0.001	8.97	**16.2**	53.9
► SFO fit for JAU 6476-desthio statistically and visually good. ► **Conclusion**: JAU 6476-desthio is well described using SFO kinetics together with SFO for prothioconazole						
R812595 - [redacted] (Great Britain)[c)]						
Fit together with prothioconazole						
SFO	k: 0.0171 ff: 0.708	6.28	k: < 0.001 ff: < 0.001	+	41	135
► SFO fit for JAU 6476-desthio statistically and visually good. However, the prothioconazole results in this fit deviated strongly from the results of the first fit, and the prothioconazole curve did not look acceptable. Therefore, JAU 6476-desthio was fitted again with fixed prothioconazole parameters						
Prothioconazole parameters fixed:						
SFO	k: 0.0136 ff: 0.585	12.4	k: < 0.001 ff: < 0.001	+	**50.9**	169
► SFO fit for JAU 6476-desthio statistically and visually good. ► **Conclusion**: JAU 6476-desthio is well described using SFO kinetics together with SFO for prothioconazole.						
R812609 – [redacted] (France North)[c)]						
Fit together with prothioconazole						
SFO	k: 0.125 ff: 0.417	14.0	k: < 0.001 ff: < 0.001	+	**55.6**	185
► SFO fit for JAU 6476-desthio statistically and visually good.. ► **Conclusion**: JAU 6476-desthio is well described using SFO kinetics together with SFO for prothioconazole						
R812617 - [redacted] (Great Britain)[d)]						
Fit together with prothioconazole						
SFO	k: 0.0187 ff: 0.782	10.7	k: < 0.001 ff: < 0.001	+	37.2	123
► SFO fit for JAU 6476-desthio statistically and visually good. However, the prothioconazole results in this fit deviated strongly from the results of the first fit, and the prothioconazole curve did not look acceptable. Therefore, JAU 6476-desthio was fitted again with fixed prothioconazole parameters from the initial fit above						
Prothioconazole parameters fixed:						
SFO	k: 0.0140 ff: 0.613	17.5	k: < 0.001 ff: < 0.001	+	**49.3**	164
► SFO fit for JAU 6476-desthio statistically and visually good. ► **Conclusion**: JAU 6476-desthio is well described using SFO kinetics together with SFO for prothioconazole.						
R812625 – [redacted] (France North)[d)]						
Fit together with prothioconazole						
SFO	k: 0.0143 ff: 0.383	7.84	k: < 0.001 ff: < 0.001	+	**48.4**	161
► SFO fit for JAU 6476-desthio statistically and visually good. ► **Conclusion**: JAU 6476-desthio is well described using SFO kinetics together with SFO for prothioconazole						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel *cont.*
b) visual fit: + = good, o = moderate, - = poor
c) bare soil
d) cropped with spring barley in the first and grass in the second year

Table 7.1.2.2.1- 10 *(cont.)*: Trigger endpoints (field DT_{50}) and statistical parameters of JAU 6476-desthio *(M04)* (fit together with prothioconazole)
best fits highlighted in bold letters

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
R812633 – [redacted] (France South)[d)]						
Fit together with prothioconazole						
SFO	k: 0.0109 ff: 0.671	12.3	k: < 0.001 ff: < 0.001	+	**63.4**	211
► SFO fit for JAU 6476-desthio statistically and visually good. ► **Conclusion**: JAU 6476-desthio is well described using SFO kinetics together with SFO for prothioconazole						
R815667 – [redacted] (Italy)[d)]						
Fit together with prothioconazole						
SFO	k: 0.0215 ff: 0.494	7.07	k: < 0.001 ff: < 0.001	+	**32.2**	107
► SFO fit for JAU 6476-desthio statistically and visually good. ► **Conclusion**: JAU 6476-desthio is well described using SFO kinetics together with SFO for prothioconazole						
R815675 – [redacted] (Germany)[c)]						
Fit together with prothioconazole						
SFO	k: 0.257 ff: 0.764	6.52	k: < 0.001 ff: < 0.001	+	**27.0**	90
► SFO fit for JAU 6476-desthio statistically and visually good. ► **Conclusion**: JAU 6476-desthio is well described using SFO kinetics together with SFO for prothioconazole						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor
c) bare soil
d) cropped with spring barley in the first and grass in the second year

III. CONCLUSIONS

DT_{50} values (trigger endpoints) ranged from 1.2 days to 1.6 days for prothioconazole and from 16.2 days to 63.4 days for JAU 6476-desthio *(M04)*. The kinetic parameters determined for the dissipation under realistic field conditions are considered appropriate as trigger endpoints.

Kinetic evaluations for modelling endpoints

The dissipation of prothioconazole and the metabolite JAU 6476-desthio *(M04)* in agricultural soils under natural field conditions was investigated in eight trials in Europe by [redacted] (2001) (KCA 7.1.2.2.1 /01, included in the Baseline Dossier). Based on these trials, two kinetic evaluations were performed to estimate normalised (20°C, pF 2) dissipation times (DT_{50}) for use in model simulations of environmental exposures (modelling endpoints) for prothioconazole and the metabolite JAU 6476-desthio.

The first kinetic evaluation ([redacted], 2012, KCA 7.1.2.2.1 /06) was performed according to the guidance given by the FOCUS kinetics report at that time (FOCUS, 2006) and the second evaluation ([redacted] and [redacted], 2015, KCA 7.1.2.2.1 /07) was conducted to derive kinetic parameters according to EFSA Guidance 2014 and FOCUS Guidance 2014.

In the field dissipation trials, prothioconazole dissipated completely from soil within a few days: in general, there were only one or two measurements > LOQ, and nearly no residues were left when 10 mm of cumulative rainfall were reached. Therefore, it is not possible to derive modelling endpoints for prothioconazole according to EFSA, 2014 and only the metabolite JAU 6476-desthio *(M04)* could be addressed in the second evaluation ([redacted] and [redacted], 2015, KCA 7.1.2.2.1 /07). Therefore, for the parent compound, the DT_{50} derived from the first kinetic evaluation ([redacted], 2012, KCA 7.1.2.2.1 /06) will be used.

New kinetic evaluation submitted for Annex I renewal

Justification for including this study in the Annex I Renewal Dossier: The objective of this study is to estimate dissipation times (DT_{50}) of prothioconazole at study conditions (KCA 7.1.2.2.1 /01, included in the Baseline Dossier) for use as modelling endpoints. The evaluation was conducted to derive kinetic parameters according to FOCUS Guidance 2006.

Report:	**KCA 7.1.2.2.1 /06; [redacted], I. A. J.; 2012**
Title:	Kinetic modelling analysis of prothioconazole from field soil residue studies conducted in Europe normalised to 20°C and pF2
Report No:	VC/11/022F
Document No:	M-429069-01-1
Guidelines:	FOCUS (2006): Guidance Document on Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration" Report of the FOCUS Work Group on Degradation Kinetics, EC Document Reference Sanco/10058/2005 version 2.0, 434 pp.
GLP:	No (calculation)
Justification:	New data / guideline requirement: Kinetic analysis of the degradation prothioconazole for modelling endpoints

Executive Summary

The aim of this evaluation was to conduct a kinetic modelling analysis for prothioconazole and JAU 6476-desthio *(M04)* from European field soil dissipation studies in order to derive normalised DT_{50} values (20ºC and pF2) for use in subsequent risk assessments. In this dossier only the data for prothioconazole will be summarised (JAU 6476-desthio see KCA 7.1.2.2.1 /07).

The dissipation of prothioconazole in agricultural soils under natural field conditions was investigated in eight trials in Europe ([redacted], 2001, KCA 7.1.2.2.1 /01, included in the Baseline Dossier). The kinetic evaluation was performed according to the guidance given by the FOCUS Kinetics report at that time (FOCUS, 2006).

Daily soil temperatures and moisture contents were used to normalise the data to reference conditions according to FOCUS groundwater assumptions (Q_{10} of 2.58 and Walker B-factor moisture exponent of 0.7).

All datasets were evaluated with KinGUI2 in a stepwise procedure using simple first-order (SFO)

kinetics with free optimisation of all parameters according to FOCUS kinetics guidance (FOCUS, 2006). Evaluations with SFO kinetics resulted in acceptable fits both visually and statistically for prothioconazole (min Chi^2 error 1.1 - 32.2%, t-test > 99% significance).
The median normalised DT_{50} value of 0.90 days (Table 7.1.2.2.1- 11) for prothioconazole are considered appropriate for use in environmental risk assessments, along with an average formation fraction of 0.60 for JAU 6476-desthio *(M04)*.

Table 7.1.2.2.1- 11: DT_{50} values for prothioconazole normalised to reference conditions of 20°C and pF2

Study	Annex Point / Reference No	Location	Kinetic type[a]	DT_{50} [days]
[redacted] (2001)	KCA 7.1.2.2.1 /01	R812587 (Germany)	SFO	1.32
		R812595 (Great Britain)	SFO	1.09
		R812609 (France, North)	SFO	0.75
		R812617 (Great Britain)	SFO	1.38
		R812625 (France, North)	SFO	0.73
		R812633 (France, South)	SFO	0.70
		R815667 (Italy)	SFO	0.97
		R815675 (Germany)	SFO	0.82
Geometric mean				**0.94**
Median				**0.90**

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

I. METHODS

The behaviour of prothioconazole under field conditions was investigated in one terrestrial field soil dissipation study, encompassing eight trial sites located throughout Europe (France, Germany, Italy and UK, [redacted], 2001). All trials were considered in the evaluation (Baseline Dossier, KCA 7.1.2.2.1 /01) were used. The field dissipation trials were carried out at eight sites across Europe in order to cover different representative agro-climatic regions. Each test site received a single application at a nominal application rate of the active substance prothioconazole of 200 g/ha. Application was made on bare soil. At 4 trials, the soil was maintained bare; at the other 4 trials spring barley was sown at the day of application or a few days before.
The kinetic evaluation was performed according to the guidance given by the FOCUS Kinetics report at that time (FOCUS, 2006). Weather data and soil properties were taken from the studies. Soil moisture and temperature for the normalisation of the modelling endpoints were calculated with FOCUS PEARL 3.3.3. All datasets were evaluated with KinGUI2 in a stepwise procedure using simple first-order (SFO) kinetics with free optimisation of all parameters according to FOCUS kinetics guidance [FOCUS, 2006].

II. RESULTS AND DISCUSSION

Modelling endpoints (temperature and moisture normalised) for prothioconazole were derived following the procedure described in FOCUS (2006). Daily soil temperatures and moisture contents were used to normalise the data to reference conditions according to FOCUS groundwater assumptions. All datasets gave acceptable minimum Chi^2 error values for field studies (1.1 - 32.2%) and t-test parameter significance of > 99% and are considered appropriate for evaluation as modelling endpoints. An overview of the modelling endpoints is given in Table 7.1.2.2.1- 11 in the Executive Summary. The modelling endpoints and statistical parameters for prothioconazole are given in Table 7.1.2.2.1- 12. The median normalised DT_{50} value of 0.90 days for prothioconazole are considered appropriate for use in environmental risk assessments, along with an average formation fraction of 0.60 for JAU 6476-desthio *(M04)* (Table 7.1.2.2.1- 13).

Table 7.1.2.2.1- 12: Prothioconazole parameter optimisation results

Trial	M_0 [µg/kg]	DT_{50} [days]	DT_{90} [days]	Min Chi^2 error [%]	t-test
R812587 (Germany)	115.5	1.32	4.39	1.2	> 99%
R812595 (Great Britain)	120.3	1.09	3.63	26.8	> 99%
R812609 (France, North)	141.7	0.75	2.48	4.5	> 99%
R812617 (Great Britain)	113.2	1.38	4.57	32.2	> 99%
R812625 (France, North)	139.8	0.73	2.42	1.1	> 99%
R812633 (France, South)	79.4	0.70	2.32	2.0	> 99%
R815667 (Italy)	80.5	0.97	3.23	2.1	> 99%
R815675 (Germany)	105.0	0.82	2.72	2.0	> 99%
Geometric mean		**0.94**			
Median		**0.90**			

Table 7.1.2.2.1- 13: Formation fraction of JAU 6476-desthio *(M04)*

Trial	Formation fraction
R812587 (Germany)	0.72
R812595 (Great Britain)	0.67
R812609 (France, North)	0.42
R812617 (Great Britain)	0.76
R812625 (France, North)	0.39
R812633 (France, South)	0.65
R815667 (Italy)	0.48
R815675 (Germany)	0.74
Arithmetic mean	**0.60**
Median	**0.66**

III. CONCLUSIONS

All datasets were evaluated using SFO kinetics in a stepwise procedure with free optimisation of all parameters, resulting in acceptable fits.
The optimised model fits for prothioconazole at all locations showed visibly acceptable fits to the data with the residual analysis plots also being satisfactory (random scatter of residuals). A high significance level was obtained for the estimated parameters.
The median DT_{50} values of 0.90 days for prothioconazole is considered appropriate for use in environmental risk assessments.

New kinetic evaluation submitted for Annex I renewal

Justification for including this study in the Annex I Renewal Dossier: The objective of this study is to estimate dissipation times (DT_{50}) of JAU 6476-desthio *(M04)* at study conditions (KCA 7.1.2.2.1 /01, included in the Baseline Dossier) for use as modelling endpoints. The evaluation was conducted to derive kinetic parameters according to EFSA Guidance 2014 and FOCUS Guidance 2014.

Report:	**KCA 7.1.2.2.1 /07; [redacted], A.C.; [redacted], C.; 2015**
Title:	Prothioconazole (PTZ) kinetics aerobic soil field - Kinetic evaluation (modelling endpoints) of the soil dissipation of desthio (metabolite of prothioconazole) under field conditions (evaluation according to EFSA guidance 2014 and FOCUS guidance 2014)
Report No:	EnSa-15-0284
Document No:	M-535790-01-1
Guidelines:	- EFSA, 2014: Guidance Document for evaluating laboratory and field dissipation studies to obtain DegT50 values of active substances of plant protection products and transformation products of these active substances in soil, European Food Safety Authority (EFSA), Parma, Italy, EFSA Journal 2014;12(5):3662 - FOCUS, 2014: Generic guidance for Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration, Version: 1.1; Date: 18 December 2014
GLP:	No (calculation)
Justification:	New data / guideline requirement: Kinetic analysis of the degradation JAU 6476-desthio *(M04)* for modelling endpoints

Executive Summary

The purpose of this study was to estimate normalised (20°C, pF2) dissipation times (DT_{50}) for use in model simulations of environmental exposure (modelling endpoints) for JAU 6476-desthio *(M04)*.

The dissipation of prothioconazole and the metabolite JAU 6476-desthio in agricultural soils under natural field conditions was investigated in eight trials in Europe ([redacted], 2001, KCA 7.1.2.2.1 /01, included in the Baseline Dossier). The present report comprises the evaluation of the data according to the most recent EFSA guidance for evaluating field dissipation studies (EFSA, 2014). The kinetic evaluation was also performed according to the guidance given by the FOCUS Kinetics report (FOCUS, 2014). Weather data and soil properties were taken from the studies. Soil moisture and temperature for the normalisation of the modelling endpoints were calculated with FOCUS PEARL 3.3.3. Degradation parameters were fitted with the software KinGUI 2.1.

Three kinetic models, Single First-Order (SFO) and the bi-exponential models DFOP (double first order parallel) and HS (Hockey-stick) are assumed to adequately describe the dissipation of the applied substance in field trials (FOCUS, 2014). Only the kinetic model SFO was used; DFOP and HS were not used in the report.

Prothioconazole dissipated totally from soil within a few days: In general, there were only one or two measurements > LOQ, and nearly no residues were left when 10 mm of cumulative rainfall were reached. Therefore, it is not possible to derive modelling endpoints for prothioconazole according to EFSA, 2014.

The metabolite JAU 6476-desthio is formed nearly instantaneously in soil. Due to the low number of measurements of the parent, it was not possible to simulate formation and decline of the metabolite together with prothioconazole. As a consequence, endpoints for JAU 6476-desthio were calculated for the decline phase of the metabolite considering only sampling dates after 10 mm cumulative rainfall as recommended by EFSA, 2014. By omitting the initial sampling dates, surface dissipation processes can be precluded for JAU 6476-desthio, and only SFO kinetics were fitted.

Normalised DT_{50} values (modelling endpoints) for JAU 6476-desthio ranged from 18.8 days to 32.2 days, with a geometric mean of 24.7 days. The normalised kinetic parameters determined for the dissipation under realistic field conditions are considered appropriate as input for modelling purposes. The DT_{50} values for JAU 6476-desthio derived by the evaluation of the field trials are shown in Table 7.1.2.2.1- 11.

Table 7.1.2.2.1- 14: Modelling endpoints (field DT_{50}) of JAU 6476-desthio *(M04)* normalised to 20°C and pF2

Study	Annex Point / Reference No	Location	Kinetic type[a]	DT_{50} [days]
[redacted] (2001)	KCA 7.1.2.2.1 /01	R812587 (Germany)	--	not used
		R812595 (Great Britain)	SFO	24.7
		R812609 (France, North)	SFO	23.8
		R812617 (Great Britain)	SFO	23.3
		R812625 (France, North)	SFO	23.8
		R812633 (France, South)	SFO	32.2
		R815667 (Italy)	SFO	28.7
		R815675 (Germany)	SFO	18.8
Geometric mean				**24.7**

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

In addition a maximum portion of prothioconazole degrading to JAU 6476-desthio of 56% can be obtained on the basis of the field trial data. Due to the rapid decline of the parent, this is a reasonable estimate of the maximum occurrence of JAU 6476-desthio, for use in the relevant calculations.

I. METHODS

The behaviour of prothioconazole under field conditions was investigated in one terrestrial field soil dissipation study, encompassing eight trial sites located throughout Europe (France, Germany, Italy and UK, [redacted], 2001). All trials were considered in the evaluation (Baseline Dossier, KCA 7.1.2.2.1 /01) were used. The field dissipation trials were carried out at eight sites across Europe in order to cover different representative agro-climatic regions. Each test site received a single application at a nominal application rate of the active substance prothioconazole of 200 g/ha. Application was made on bare soil. At 4 trials, the soil was maintained bare; at the other 4 trials spring barley was sown at the day of application or a few days before.

The present report comprises the evaluation of the data according to the most recent EFSA guidance for evaluating field dissipation studies (EFSA, 2014). The kinetic evaluation was also performed according to the guidance given by the FOCUS Kinetics report (FOCUS, 2014). Weather data and soil properties were taken from the studies. Soil moisture and temperature for the normalisation of the modelling endpoints were calculated with FOCUS PEARL 3.3.3. Degradation parameters were fitted with the software KinGUI 2.1.

Three kinetic models, Single First-Order (SFO) and the bi-exponential models DFOP (Double First Order Parallel) and Hockey-Stick (HS) are assumed to adequately describe the dissipation of the applied substance in field trials (FOCUS, 2014 and EFSA, 2014). Only the kinetic model SFO was used; DFOP and HS were not used in the report.

<u>Calculation of DT_{50} / DT_{90} values</u>: A half-life is defined as the time taken for 50% of substance to disappear/dissipate from a compartment following single first-order kinetics, whereas DT_{50} and DT_{90} values are not strictly connected to a first order kinetics. In this report half-lives, DT_{50} and DT_{90} values are calculated from the appropriate rate constant k as $DT_{50} = \ln(2)/k$ and $DT_{90} = \ln(10)/k$, respectively.

II. RESULTS AND DISCUSSION

Modelling endpoints (temperature and moisture normalised) for JAU 6476-desthio *(M04)* were derived following the procedure described in EFSA (2014) and FOCUS (2014). Daily soil temperatures and moisture contents were used to normalise the data to reference conditions according to FOCUS groundwater assumptions.
An overview of the modelling endpoints is given in Table 7.1.2.2.1- 11 in the Executive Summary. The modelling endpoints and statistical parameters for JAU 6476-desthio are given in Table 7.1.2.2.1- 12.

A maximum portion of prothioconazole degrading to JAU 6576-desthio of 56% can be obtained on the basis of the field trials data (see Table 7.1.2.2.1- 16). Due to the rapid decline of the parent, this is a reasonable estimate of the maximum occurrence of JAU 6476-desthio, for use in the relevant calculations. The concentrations of parent and JAU 6476-desthio immediately after application are listed in Table 7.1.2.2.1- 16. From these values, the percentages of the applied amounts were calculated for prothioconazole, JAU 6476-desthio and for the sum of prothioconazole and JAU6476-desthio.
In three of the eight trials, the desthio concentration increased after the application date. However, in these trials the maximum occurrence did not exceed 56% of the applied amount. Otherwise, JAU 6476desthio concentrations decreased from day 0.
As the degradation rate of JAU 6476-desthio is more than an order of magnitude less than the rate of the parent and the degradation of the parent is very fast, only insignificant portions of JAU 6476-desthio are assumed to degrade during the fast generation period of the few days after application. Therefore, the maximum occurrence of the metabolite in these trials is an appropriate estimation for the maximum occurrence of desthio during the degradation of the parent to JAU 6476-desthio – i.e., 56%.

Table 7.1.2.2.1- 15: Modelling endpoints (field DT_{50}) and statistical parameters of JAU 6476-desthio *(M04)* normalised to 20°C and pF2
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
R812587 - [redacted] (Germany)[c)]						
SFO	M_0: 25.1 k: 0.0889	17.3	k: 0.042	o	**7.80**	25.9
► SFO fit is not acceptable, Chi² is above 15, and visual fit with only four data points does not seem reliable ► **Conclusion**: do not use this trial						
R812595 - [redacted] (Great Britain)[c)]						
SFO	M_0: 31.6 k: 0.0281	10.0	k: 0.002	+	**24.7**	82.1
► SFO fit statistically and visually good ► **Conclusion**: DT_{50} is well described using SFO kinetics						
R812609 – [redacted] (France North)[c)]						
SFO	M_0: 43.9 k: 0.0291	13.2	k: 0.001	+	**23.8**	79.1
► SFO fit statistically and visually good ► **Conclusion**: DT_{50} is well described using SFO kinetics						
R812617 - [redacted] (Great Britain)[d)]						
SFO	M_0: 28.4 k: 0.0298	19.3	k: 0.015	o	**23.3**	77.3
► SFO fit statistically and visually good ► **Conclusion**: DT_{50} is well described using SFO kinetics						
R812625 – [redacted] (France North)[d)]						
SFO	M_0: 33.3 k: 0.0291	9.38	k: <0.001	+	**23.8**	79.1
► SFO fit statistically and visually good ► **Conclusion**: DT_{50} is well described using SFO kinetics						
R812633 – [redacted] (France South)[d)]						
SFO	M_0: 40.8 k: 0.0215	10.4	k: 0.001	+	**32.2**	107
► SFO fit statistically and visually good ► **Conclusion**: DT_{50} is well described using SFO kinetics						
R815667 – [redacted] (Italy)[d)]						
SFO	M_0: 30.7 k: 0.0242	6.99	k: <0.001	+	**28.7**	95.3
► SFO fit statistically and visually good ► **Conclusion**: DT_{50} is well described using SFO kinetics						
R815675 – [redacted] (Germany)[c)]						
SFO	M_0: 60.8 k: 0.0369	6.36	k: <0.001	++	**18.8**	62.4
► SFO fit statistically and visually good ► **Conclusion**: DT_{50} is well described using SFO kinetics						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor
c) bare soil
d) cropped with spring barley in the first and grass in the second year

Table 7.1.2.2.1- 16: Concentrations of prothioconazole (JAU 6476) and JAU 6476-desthio *(M04)* immediately after application

Trial no (location)	Concentrations [µg/kg] immediately aftter application of		Percentage [%] of the applied amount		
	JAU 6476	JAU 6476-desthio *(M04)*[a]	JAU 6476	JAU 6476 + JAU 6476-desthio *(M04)*	JAU 6476-desthio *(M04)*
R812587 (Germany)	65.8	49.7	49.5	86.8	37.4
R812595 (Great Britain)	57.3	65.3	43.1	92.2	49.1
R812609 (France, North)	67.4	74.3	50.7	106.5	55.9
R812617 (Great Britain)	44.0	73.0	33.1	88.0	54.9
R812625 (France, North)	65.0	74.8	48.9	105.1	56.2
R812633 (France, South)	35.5	43.9	26.7	59.7	33.0
R815667 (Italy)	38.0	42.6	28.6	60.6	32.0
R815675 (Germany)	70.3	34.6	52.9	78.9	26.0

a) the concentrations of JAU6476-desthio were converted to concentrations of JAU6476 by the following equation:

$$Conc_{JAU6476\text{-}desthio\ converted} = Conc_{JAU6476\text{-}desthio} \times \frac{\text{Molar Weight}_{JAU6476}}{\text{Molar Weight}_{JAU6476-desthio}}$$

III. CONCLUSIONS

Prothioconazole dissipated totally from soil within a few days: In general, there were only one or two measurements > LOQ, and nearly no residues were left when 10 mm of cumulative rainfall were reached. Therefore, it is not possible to derive modelling endpoints for prothioconazole according to EFSA, 2014.
Normalised DT_{50} values (modelling endpoints) for JAU 6476-desthio *(M04)* ranged from 18.8 days to 32.2 days, with a geometric mean of 24.7 days. The normalised kinetic parameters determined for the dissipation under realistic field conditions are considered appropriate as input for modelling purposes.

A maximum portion of prothioconazole degrading to JAU 6476-desthio of 56% can be obtained on the basis of the field trial data. Due to the rapid decline of the parent, this is a reasonable estimate of the maximum occurrence of JAU 6476-desthio, for use in the relevant calculations.

CA 7.1.2.2.2 Soil accumulation studies

The accumulation potential of prothioconazole was evaluated during the Annex I Inclusion. No additional studies have been performed. Due to the use pattern and the degradation rates of prothioconazole no accumulation in soil would be expected.

CA 7.1.3 Adsorption and desorption in soil

CA 7.1.3.1 Adsorption and desorption

K_d and K_{oc} values of prothioconazole could not be determined in batch equilibrium studies due to the instability of the compound in these systems. Therefore, a parent column leaching and an aged residue column leaching study were performed (see CA 7.1.4.1.1).

The mobility of the two major soil metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* was assessed in batch-equilibrium adsorption/desorption studies and also for the major aquatic metabolite 1,2,4-triazole *(M13)*. The calculated adsorption constants and correlation coefficients are listed in Table 7.1.3.1- 2 to Table 7.1.3.1- 5.

An overall summary is given in Table 7.1.3.1- 1. This table mentioned in addition information on adsorption behaviour of the major aquatic photometabolite JAU 6476-thiazocine *(M12)* and the aquatic metabolite JAU 6476-triazolylketone *(M42)*.

Table 7.1.3.1- 1: Overall summary of adsorption constants $K_{oc(ads)}$ in soils of prothioconazole and its major degradation products

Compound	major metabolite in:	$K_{oc(ads)}$ [mL/g]	Document no. (Annex point / ref. no)
prothioconazole		1765[a)]	M-055836-02-1 (KCA 7.1.4.1.1 /02)
JAU 6476-S-methyl *(M01)*	soil water-sediment	2556.3 / 2525.9[b)]	M-022914-01-1 (KCA 7.1.3.1.2 /01)
JAU 6476-desthio *(M04)*	soil water	5754 / 5715[b)]	M-008501-01-1 (KCA 7.1.3.1.2 /02)
JAU 6476-thiazocine *(M12)*	aquatic photolysis	165	M-060160-01-1 (KCA 7.1.3.1.2 /03)
1,2,4-triazole *(M13)*	water	89 / 83	M-045865-02-1 (KCA 7.1.3.1.2 /04)
JAU 6476-triazolylketone *(M42)*	water	c)	c)

a) determined on the basis of an aged soil column leaching study
b) arith. mean / geom. mean
c) The adsorption behaviour of JAU 6476-triazolylketone is unknown, so the K_{oc} used in the PEC calculations was set to 1 mL/g. A calculation based on EPISuite (EPA, 2012[1]) gave a K_{oc} of 11 to 17 mL/g

Table 7.1.3.1- 2: Overall summary of adsorption in soil of prothioconazole, based on the results of an aged residue column leaching study

Soil	Texture (USDA)	pH	Document no. (Annex point / ref. no.)	$K_{d(ads)}$ [mL/g]	$K_{oc(ads)}$ [mL/g]
Byromville	loamy sand	6.7	M-055836-02-1 (KCA 7.1.4.1.1 /02)	15.2	1765

[1] EPA (2012) EPISuite™ from U.S. Environmental Protection Agency (URL: http://www.epa.gov/oppt/exposure/pubs/episuite.htm)

Table 7.1.3.1- 3: Overall summary of adsorption constants and correlation coefficients in soils of JAU 6476-S-methyl *(M01)*

Soil	Texture (USDA)	pH	Document no. (Annex point / ref. no.)	$K_{f(ads)}$ [mL/g]	1/n	$K_{oc(ads)}$ [mL/g]
LH AXXa	sandy loam	7.2	M-022914-01-1 (KCA 7.1.3.1.2 /01)	56.0	0.87	2772.4
[redacted]	silt	7.1		64.1	0.88	2995.0
[redacted]	silty clay loam	5.9		41.2	0.91	2484.0
[redacted]	loamy sand	6.8		15.6	0.85	1973.6
Arithmetic mean					**0.88**	**2556.3**
Geometric mean						**2525.9**

Table 7.1.3.1- 4: Overall summary of adsorption constants and correlation coefficients in soils of the major soil metabolites JAU 6476-desthio *(M04)*

Soil	Texture (USDA)	pH	Document no. (Annex point / ref. no.)	$K_{f(ads)}$ [mL/g]	1/n	$K_{oc(ads)}$ [mL/g]
LH AXXa	sandy loam	7.2	M-008501-01-1 (KCA 7.1.3.1.2 /02)	12.46	0.79	616.8
[redacted]	silt	7.1		13.38	0.83	625.3
[redacted]	silty clay loam	5.9		8.90	0.83	536.4
[redacted]	loamy sand	6.8		4.13	0.80	523.0
Arithmetic mean					**0.81**	**575.4**
Geometric mean						**573.5**

Table 7.1.3.1- 5: Overall summary of adsorption constants and correlation coefficients in soils of the major aquatic metabolite 1,2,4-triazole *(M13)*

Soil	Texture (USDA)	pH	Document no. (Annex point / ref. no.)	$K_{f(ads)}$ [mL/g]	1/n	$K_{oc(ads)}$ [mL/g]
[redacted], USA	silty clay	8.8	M-045865-02-1 (KCA 7.1.3.1.2 /04)	0.833	0.897	120
[redacted], USA	clay loam	6.9		0.748	0.827	43
([redacted] USA)[a)]	sand	4.8		(0.234)[a)]	(0.885)[a)]	(202)[a)]
[redacted] USA	silty clay loam	7.0		0.722	0.922	104
[redacted], USA	sandy loam	6.9		0.719	1.016	89
Arithmetic mean					**0.92**	**89**
Geometric mean						**83**

a) Value of 202 mL/g resulting from the soil [redacted] was discarded as an outlier due to the low organic carbon content of the soil. Therefore, the **geometric** mean of **83 mL/g** should be used for modelling purposes

CA 7.1.3.1.1 Adsorption and desorption of the active substance

K_d and K_{oc} values of prothioconazole could not be determined in batch equilibrium studies due to the instability of the compound in these systems. Therefore, a parent column leaching and an aged residue column leaching study were performed (see CA 7.1.4.1.1).

CA 7.1.3.1.2 Adsorption and desorption of metabolites, breakdown and reaction products

The adsorption and desorption behaviours of the major soil degradation products JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* in batch equilibrium experiments were evaluated during the Annex I inclusion using the phenyl-labelled positions, and were accepted by the European Commission (EFSA Scientific Report (2007) 106, 1-98, 12 July 2007). The following studies are included in the Baseline Dossier:

Annex point / reference no.	Author(s)	Year	Document no.
JAU 6476-S-methyl *(M01)*			
KCA 7.1.3.1.2 /01	[redacted], W.	1999	M-022914-01-1
JAU 6476-desthio *(M04)*			
KCA 7.1.3.1.2 /02	[redacted], G.	1998	M-008501-01-1

For a better understanding the corresponding summaries of these studies as given in the Baseline Dossier are given below (grey coloured).

Two additional studies have been performed for the major aquatic photometabolite JAU 6476-thiazocine *(M12)* and the major aquatic degradation product 1,2,4-triazol *(M13)*, and are submitted within this Supplemental Dossier for the prothioconazole renewal of approval ([redacted], 2001, KCA 7.1.3.1.2 /03 and [redacted], 1988, KCA 7.1.3.1.2 /04, respectively). A summary of the adsorption and desorption behaviour of prothioconazole and its major degradation products in soil is given in section CA 7.1.3.1.

- **JAU 6476-S-methyl *(M01)***

Report:	**KCA 7.1.3.1.2 /01; [redacted], W.; 1999**
Title:	Adsorption/desorption of S-methyl-JAU6476 on four different soils
Report No:	FM774
Document No:	M-022914-01-1
Guidelines:	- Commission Directive 95/36/EC of 14 July 1995 amending Council Directive 91/414/EEC concerning the placing of plant protection products on the market, Official Journal of the European Communities No. L 172, 22/07/1995 - OECD Guideline for Testing of Chemicals No.: 106: "Adsorption/Desorption", January 2000 - U.S. Environmental Protection Agency (U.S. EPA). 1982. Pesticide Assessment Guidelines, Subdivision N, Chemistry: Environmental Fate, Section 163-1, Leaching and Adsorption/Desorption Studies. U.S. EPA, [redacted]
GLP:	Yes

Test System: A batch equilibrium procedure was used to determine the K_d and K_{oc} values of phenyl-labelled JAU 6476-S-methyl *(M01)* in four different soils, sandy loam ([redacted] AXXa), silt ([redacted]), silty clay loam ([redacted]), and loamy sand ([redacted]). The characteristics of the soils are given in Table 7.1.3.1.2- 1.

Table 7.1.3.1.2- 1: Characteristics of soils used for adsorption/desorption of phenyl-labelled JAU 6476-S-methyl *(M01)* on four soils

Soil	Soil Type	Sand[a)] (%)	Silt[a)] (%)	Clay[a)] (%)	Org. C (%)	pH in H_2O
[redacted] AXXa, Rhineland, Germany	sandy loam	72.4	22.6	5.0	2.02	7.2
[redacted], Rhineland, Germany	silt	8.5	81.3	10.4	2.14	7.1
[redacted] Kansas, USA	silty clay loam	12.4	48.0	39.6	1.6[illegible]	5.[illegible]
[redacted] Georgia, USA	loamy sand	86.8	7.6	5.6	0.79	6.8

a) = textural analysis [USDA]

Findings:

For JAU 6476-S-methyl (M01), the adsorption process in the concentration range studied (0.67, 0.21, 0.06 and 0.03 mg/L $CaCl_2$ solution) could be described with high accuracy by the Freundlich equation. The adsorption constants K_d calculated from the Freundlich isotherms for the four soils ranged from 15.6 to 64.1 mL/g. When recalculating the K_d values with the organic carbon content of the soils, K_{oc} values of 1973.6 to 2995.0 mL/g were obtained.

The portions of JAU 6476-S-methyl *(M01)* being adsorbed ranged from 79 to 85% ([redacted] AXXa), from 81 to 86% ([redacted]), from 70 to 76% ([redacted]), and from 40 to 61% ([redacted]), respectively. Running a desorption experiment with 0.01 M $CaCl_2$ solution, 13 to 46% of adsorbed JAU 6476-S-methyl *(M01)* was desorbed again. This gives calculated desorption K_d values from 20.0 to 71.9 mL/g, and corresponding K_{oc} values from 2532.0 to 3358.6 mL/g.

The results of the adsorption/desorption experiments are summarised in Table 7.1.3.1.2- 2.

Based on the results of this study JAU 6476-S-methyl *(M01)* must be considered to be immobile in soils of textural classes tested. In order to ensure consistency within the EU dossier, classifications of the results of the adsorption and mobility studies were based on the classification scheme of Briggs (1973[1]).

Table 7.1.3.1.2- 2: Adsorption and desorption of phenyl-labelled JAU 6476-S-methyl *(M01)* on four different soils

Soil Designation	Adsorption			Desorption		
	K_d (mL/g)	1/n	K_{oc} (mL/g)	K_d (mL/g)	1/n	K_{oc} (mL/g)
[redacted] AXXa	56.0	0.87	2775.4	63.1	0.86	3124.7
[redacted]	64.[illegible]	0.88	2995.0	71.9	0.88	3358.6
[redacted]	41.2	0.91	2584.0	48.6	0.91	2925.9
[redacted]	15.6	0.85	1973.6	20.0	0.85	2532.0
Mean:	*44.3*	*0.88*	*2556.3*	*50.9*	*0.88*	*2985.3*

[1] Briggs, G.G. (1973)
A simple relationship between soil adsorption of organic chemicals and their octanol/water partition coefficients
Proc. 7th British Insecticide and Fungicide Conference, Nottingham/UK, 83-86, 1973

- **JAU 6476-desthio *(M04)***

Report:	**KCA 7.1.3.1.2 /02; [redacted], G.; 1998**
Title:	Adsorption/desorption of [phenyl-UL-14C]SXX0665 on four different soils
Report No:	FM768
Document No:	M-008501-01-1
Guidelines:	- Commission Directive 95/36/EC of 14 July 1995 amending Council Directive 91/414/EEC concerning the placing of plant protection products on the market, Official Journal of the European Communities No. L 172, 22/07/1995 - OECD-Guideline for Testing of Chemicals No. 106: "Adsorption/Desorption", January 2000 - U. S. Environmental Protection Agency (U.S. EPA). 1982. Pesticide Assessment Guidelines, Subdivision N, Chemistry: Environmental Fate, Section 163-1, Leaching and Adsorption/Desorption Studies. U.S. EPA, [redacted]
GLP:	Yes

Test System: A batch equilibrium procedure was used to determine the K_d and K_{oc} values of phenyl-labelled JAU 6476-desthio *(M04)* in four different soils, sandy loam ([redacted] AXXa), silt ([redacted]), silty clay loam ([redacted]), and loamy sand [redacted]. The characteristics of the soils are given in Table 7.1.3.1.2- 3.

Table 7.1.3.1.2- 3: Characteristics of soils used for adsorption/desorption of phenyl-labelled JAU 6476-desthio *(M04)* on four soils

Soil	Soil Type	Sand[a] (%)	Silt[a] (%)	Clay[a] (%)	Org. C (%)	pH in H_2O
[redacted] AXXa, Rhineland, Germany	sandy loam	72.4	22.6	5.0	2.02	7.2
[redacted], Rhineland, Germany	silt	8.5	81.3	10.2	2.14	7.1
[redacted], Kansas, USA	silty clay loam	12.4	48.0	39.6	1.66	5.9
[redacted], Georgia, USA	loamy sand	86.8	7.6	5.6	0.79	6.8

a) = textural analysis USDA

Findings:
For JAU 6476-desthio *(M04)*, the adsorption process in the concentration range studied (4.32, 0.87, 0.18 and 0.04 mg/L $CaCl_2$ solution) could be described with high accuracy by the Freundlich equation. The adsorption constants K_d calculated from the Freundlich isotherms for the four soils ranged from 4.13 to 13.38 mL/g. When recalculating the K_d values with the organic C content of the soils, K_{oc} values of 523.0 to 625.3 mL/g were obtained.
The portions of JAU 6476-desthio *(M04)* being adsorbed ranged from 63 to 85% ([redacted] AXXa), from 64 to 72% ([redacted]), from 73 to 74% ([redacted]), and from 61 to 83% ([redacted]), respectively. Running a desorption experiment with 0.01 M $CaCl_2$ solution, 6.1 to 44.6% of adsorbed JAU 6476-desthio *(M04)* was desorbed again. This gives calculated desorption K_d values from 6.92 to 14.75 mL/g, and corresponding K_{oc} values from 561.6 to 876.2 mL/g.
The results of the adsorption/desorption experiments are summarised in Table 7.1.3.1.2- 4.
Based on the results of this study JAU 6476-desthio *(M04)* must be considered to have low mobility in soils of textural classes tested. In order to ensure consistency within the EU-Dossier, classifications of the results of the adsorption and mobility studies were based on the classification scheme of Briggs

(1973[1]).

Table 7.1.3.1.2- 4: Adsorption and desorption of phenyl-labelled JAU 6476-desthio *(M04)* on four different soils

Soil Designation	Adsorption K_d (mL/g)	Adsorption 1/n	Adsorption K_{oc} (mL/g)	Desorption K_d (mL/g)	Desorption 1/n	Desorption K_{oc} (mL/g)
[redacted] AXXa	12.46	0.79	616.8	12.55	0.77	621.5
[redacted]	13.38	0.83	625.2	14.75	0.82	689.4
[redacted]	8.90	0.83	536.4	9.32	0.84	561.6
[redacted]	4.13	0.80	523.0	6.92	0.83	876.2
Mean:	*9.7*	*0.81*	*575.4*	*10.9*	*0.82*	*687.2*

- **JAU 6476-Thiazocine *(M12)***

JAU 6476-thiazocine was found as a major degradation product in an aquatic photolysis study with prothioconazole.

New study submitted for Annex I Renewal

Justification for including this study in the Annex I Renewal Dossier: This study was submitted to cover the new guideline requirement on the major photodegradation product JAU 6476-thiacozine *(M12)*.

Report:	**KCA 7.1.3.1.2 /03; [redacted], H.; 2001**
Title:	Estimation of the adsorption coefficient (Koc) of JAU6476-thiazocine on soil using high performance liquid chromatography (HPLC)
Report No:	MR-265/01
Document No:	M-060160-01-1
Guidelines:	OECD Guideline for the Testing of Chemicals, Proposal for a New Guideline 121, Estimation of the Adsorption Coefficient (KOC) on Soil and on Sewage Sludge using High Performance Liquid Chromatography (HPLC), Adopted January 22, 2001
GLP:	Yes
Justification:	New data / guideline requirement: Adsorption and desorption of major photodegradation product JAU 6476-thiazocine *(M12)*

Executive Summary

The adsorption / desorption behaviour of JAU 6476-thiazocine *(M12)*, an aquatic photometabolite of prothioconazole was estimated using High Performance Liquid Chromatography (HPLC). The retention time of the test substance measured in this study was used to calculate K_{oc} values for JAU6476-thiazocine.

Fourteen reference standards of known K_{oc} were chromatographed on a HPLC system to determine an average capacity factor k'. Sodium nitrate was used to determine the HPLC system dead time (t_0). A regression line was plotted with the determined k' values and the known K_{oc} values (log k' vs. log K_{oc}). JAU 6476-thiazocine was chromatographed on the same HPLC system during the same sample sequence as the reference substances, and average k' values were determined. The K_{oc} value for

[1] Briggs, G.G. (1973)
A simple relationship between soil adsorption of organic chemicals and their octanol/water partition coefficients
Proc. 7th British Insecticide and Fungicide Conference, Nottingham/UK, 83-86, 1973

JAU 6476-thiazocine was estimated by interpolation from the reference substance regression line. The linear regression of measured k' values against literature K_{oc} values yielded a line with a slope of 8.18, an intercept of 4.81 and a correlation coefficient R^2 of 0.837.
The estimated K_{oc} value for JAU 6476-thiazocine is 165.

I. MATERIALS AND METHODS

A. PRINCIPLE OF THE TEST

HPLC is performed on analytical columns packed with a commercially available cyanopropyl solid phase containing lipophilic and polar moieties. While passing through the column along with the mobile phase the test substance interacts with the stationary phase. As a result of partitioning between mobile and stationary phases the test substance is retarded. The dual composition of the stationary phase having polar and non-polar sites allows for interaction of polar and non-polar groups of a molecule in a similar way as is the case for organic matter in soil. This enables the relationship between the retention time on the column and the adsorption coefficient on organic matter to be established. This test is useful for chemicals, which are difficult to study in other experimental systems, i.e. a batch equilibrium test.
The pH value has a significant influence on sorption behaviour in particular for polar substances. For agricultural soils pH normally varies between pH 5.5 and 7.5.

B. MATERIALS

1. Test item

JAU 6476-thiazocine *(M12)*, unlabelled
Reference no: K972
Certified assay: 97.4%

2. Reference items

Information on the reference standards used in this study, their names, purity and concentrations used for chromatography are listed in Table 7.1.3.1.2- 5.

Table 7.1.3.1.2- 5: List of reference compounds

Compound	Purity [%]	Concentration [mg/L]
Acetanilide	≥ 99.5	4.98
Aniline	99.5	4.42
Atrazine	98.4	4.46
Cyfluthrin	96.8	4.26
N,N-Dimethylbenzamide	99	4.59
Fenthion	99.7	6.06
Isoproturon	99.5	5.46
Linuron	99.8	4.85
Methiocarb	99.5	5.67
JAU 6476-desthio	99.3	4.41
JAU 6476-S-methyl	96.9	4.65
Phenantrene	98.9	4.39
Pyrazophos	97.0	5.00
Sodium nitrate	≥ 99.5	4.78
Triadimenol	98.3	4.64

3. Test system

In the OECD guideline 121 "Estimation of the Adsorption Coefficient (K_{oc}) on Soil and on Sewage Sludge using HPLC" the test is required to be carried out using a liquid chromatograph, fitted with a

pulse-free pump and a suitable detection device. Commercial cyanopropyl chemically bound resins on a silica base was used.
As mobile phases methanol/0.01 M citrate-buffer pH 6.0 (55/45, v/v) was used.

B. PERFORMANCE OF THE TEST

1. Determination of the retention times (t_R)

Reference substances were injected two times as single compounds to determine their retention times. Injection of sodium nitrate was carried out before and after injections of the test- and reference compounds to confirm that the retention times had not drifted. If necessary, peak identification was done by comparing the UV-spectra recorded in the peaks with that of the standards.

2. Evaluation

The capacity factors k' are calculated from the dead time (t_o) and retention times (t_R) of the selected reference substances. The log k' data of the reference substances are then plotted against their log K_{oc} values from batch equilibrium experiments (given in the OECD guideline). Using this plot, the log k' value of the test substance was then used to determine its log K_{oc} value.

3. Stock solutions

An amount of 9.20 mg of JAU 6476-thiazocine *(M12)* was weighed into a 10-mL volumetric flask and diluted to volume with methanol.
An amount of approx. 10 mg of the reference substances was weighed into a 10-mL volumetric flask and diluted to volume with methanol / citrate buffer pH 6.0 (55/45, v/v).

4. Standard solutions

According to the guideline, the maximum concentration of the test substance should not exceed 1/2 the solubility in the solvent. Therefore the measurements were carried out at concentrations of approx. 5 mg/L. The solvent was similar to the mobile phase of the HPLC method (i.e. methanol / citrate buffer pH 6.0, 55/45, v/v).
A total of 0.1 mL taken from the standard stock solution was transferred into a 20-mL volumetric flask and diluted to volume with the mobile phase methanol / citrate buffer pH 6.0. The flask was shaken and ultrasonicated for one minute to dissolve the substance.

II. RESULTS AND DISCUSSION

HPLC retention time data for the reference compounds are given in Table 7.1.3.1.2- 6. The dead time (t_0) was determined using sodium nitrate to be 1.65 minutes at pH 6.0. Variability of the retention times from repetitive injections was low, confirming HPLC system stability throughout the analysis period.
The estimated K_{oc} value for JAU 6476-thiazocine is 165.

Table 7.1.3.1.2- 6: HPLC retention time data and K_{oc} calculations for JAU 647-thiazocine *(M12)*

Compound	Ret. time [min]	Dead time [min]	k'	log k'	Mean log k'	K_{oc}	log K_{oc}	Mean log K_{oc}
Sodium nitrate		1.662 1.657 1.660 1.660 1.635 1.635						
Acetanilide	2.340 2.341	1.652 1.652	0.42 0.42	-0.380 -0.379	-0.38	17.8	1.25	1.25
N,N-Dimethylbenzamide	2.451 2.455	1.652 1.652	0.48 0.49	-0.315 -0.313	-0.31	33.1	1.52	1.52
Atrazine	2.385 2.385	1.652 1.652	0.44 0.44	-0.352 -0.352	-0.35	64.6	1.81	1.81
Isoproturon	2.481 2.477	1.652 1.652	0.50 0.50	-0.299 -0.301	-0.30	72.4	1.86	1.86
Aniline	2.346 2.342	1.652 1.652	0.42 0.42	-0.376 -0.379	-0.38	117	2.07	2.07
Triadimenol	2.449 2.445	1.652 1.652	0.48 0.48	-0.316 -0.318	-0.32	251	2.40	2.40
Linuron	2.549 2.550	1.652 1.652	0.54 0.54	-0.265 -0.264	-0.26	389	2.59	2.59
Methiocarb	2.451 2.450	1.652 1.652	0.48 0.48	-0.315 -0.316	-0.32	1259	3.10	3.10
Fenthion	2.701 2.697	1.652 1.652	0.64 0.63	-0.197 -0.199	-0.20	2042	3.31	3.31
Pyrazophos	2.700 2.700	1.652 1.652	0.63 0.63	-0.197 -0.197	-0.20	4467	3.65	3.65
Phenantrene	2.926 2.927	1.652 1.652	0.77 0.77	-0.113 -0.112	-0.11	12303	4.09	4.09
Cyfluthrin	3.438 3.444	1.652 1.652	1.08 1.09	0.034 0.036	0.03	64300	4.81	4.81
JAU 6476-desthio	2.600 2.595	1.652 1.652	0.57 0.57	-0.241 -0.243	-0.24	575	2.76	2.76
JAU 6476-S-methyl	2.780 2.777	1.652 1.652	0.68 0.68	-0.165 -0.167	-0.17	2556	3.41	3.41
JAU 6476-thiazocine	2.449 2.449	1.652 1.652	0.483 0.483	-0.316 -0.316	-0.316	165 165	2.22 2.22	2.22
Mean K_{oc}						165		

Linear regression of measured k' values against literature K_{oc} values yielded a line with a slope of 8.18, an intercept of 4.81 and a correlation coefficient of R^2 = 0.837

III. CONCLUSIONS

The estimated K_{oc} value for JAU 6476-thiazocine is 165.

- **1,2,4-Triazole *(M13)***

1,2,4-Triazole was found as a major degradation product in a water-sediment study conducted with prothioconazole under aerobic conditions and in an aquatic photolysis study also performed with prothioconazole.

New study submitted for Annex I Renewal

Justification for including this study in the Annex I Renewal Dossier: This study was submitted to cover the new guideline requirement on the major aquatic metabolite 1,2,4-triazole *(M13)*.

Report:	**KCA 7.1.3.1.2 /04; [redacted], D. R., 1988**
Title:	Soil adsorption and desorption of 1,2,4-triazole
Report No:	34S-88-27
Document No:	M-045865-02-1
Guidelines:	US EPA Pesticide Assessment Guidelines, Subdivision N, Section 163-1
GLP:	Yes
Justification:	New data / guideline requirement: Adsorption and desorption of the major aquatic metabolite 1,2,4-triazole *(M13)* for the use in PEC$_{sw}$ calculations

Executive Summary

The adsorption/desorption behaviour of 1,2,4-triazole *(M13)*, a major aquatic metabolite of prothioconazole, was studied in five soils in batch equilibrium experiments in the dark at room temperature:

Table 7.1.3.1.2- 7: HPLC retention time data and K_{oc} calculations for JAU 647-thiazocine *(M12)*

Soil	Texture (USDA)	pH	OM [%]	OC[a] [%]
[redacted] USA	silty clay	8.8	1.2	0.70
[redacted] USA	clay loam	6.9	3.0	1.74
[redacted], USA	sand	4.8	0.2	0.12
[redacted], USA	silty clay loam	7.0	1.2	0.70
[redacted] USA	sandy loam	6.9	1.4	0.81

a) not mentioned in the report but calculated from OM data given in report considering a factor 1/1.724 to convert %OM in %OC

The adsorption properties of 1,2,4-triazole on five soils were studied by mixing the soil and solutions of the test material at four concentrations (0.086, 0.043,0.0085, and 0.0043 mg/L) in aqueous calcium chloride (0.01 M). After allowing 95 hours for the mixtures to reach equilibrium the mixtures were centrifuged and the supernatants decanted. The concentration of 1,2,4-triazole in the solutions was determined by radioassay. The soils tested were silty clay, clay loam, silty clay loam, sandy loam, and sand. The ratios of solution to soil were 5:1 for the silty clay, 4:1 for the clay loam and the silty clay loam, 3:1 for the sandy loam and 2:1 for the sand.

Desorption was determined by allowing the soils from the adsorption determination to equilibrate with fresh calcium chloride solutions. After 46 hours the mixtures were centrifuged and the supernatants decanted. The concentration of 1,2,4-triazole in the solutions was determined by radioassay. Fresh calcium chloride solutions were then added to the remaining soils and the resulting mixtures were shaken for 24 hours before being analysed in the same manner as the previous mixtures. Samples of the remaining soils were analysed by combustion radioassay in order to ascertain the recovery of the radioactivity.

The adsorption coefficient, K_d, and the adsorption constants corrected for the amount of organic carbon, K_{oc}, for the five soils were found to be:

Table 7.1.3.1.2- 8: Adsorption K_f and K_{foc} values for 1,2,4-triazole *(M13)*

Soil	K_f [mL/g]	K_{foc} [mL/g]
[redacted], USA	0.833	120
[redacted], USA	0.748	43
([redacted], USA)[a)]	(0.234)[a)]	(202)[a)]
[redacted], USA	0.722	104
[redacted], USA	0.719	89
Arith. mean[a)]		**89**
Geom. mean[a)]		**83**

a) Value of 202 mL/g resulting from the soil [redacted] was discarded as an outlier due to the low organic carbon content of the soil. The so calculated arith. mean value was accepted by the Dutch authority in the late 90ies and also later, in the EU review of propiconazole. Therefore, the **geometric** mean of **83 mL/g** should be used for modelling purposes

The K_f's for the desorption were found to be much higher than those for the adsorptions (an average of 77% higher for the first desorption and 704% higher for the second. Values from 2nd desorption step are not valid. The concentrations of 1,2,4-triazole in the soils were lower than the results calculated from combustion analysis of the soil. Therefore, moisture occluded in the soil and containing dissolved 1,2,4 triazole contributed to the measured radioactivity.

I. MATERIALS AND METHODS

A. MATERIALS

1. Test item

1,2,4-triazole uniformly labelled in the 3 and 5 positions
Reference No: 674.0001
Specific Activity: 404900 dpm/µg (182.4 mCi/g ≡ 6.75 MBq/g)
Radiochemical Purity: > 95%

2. Test solutions

An aqueous stock solution with a nominal concentration of 10 mg/L was made and subsequently diluted to produce the solutions for this study. All of the test solutions were made by diluting the stock solution with 0.01 M aqueous calcium chloride. The appropriate amount of the stock solution was added to a graduated cylinder and the volume was made up to the appropriate amount with the calcium chloride solution. Solutions with the nominal concentrations of 0.1, 0.05, 0.01, and 0.005 mg/L were made in this manner. The exact concentration of each of the solutions was determined by radioassay to be 0.086 mg/L, 0.043 mg/L, 0.0085 mg/L and 0.0043 mg/L (see Table 7.1.3.1.2- 9). These solutions were referred to as high (H), medium high (MH), medium low (ML), and low (L) concentration.

Table 7.1.3.1.2- 9: Concentrations of the test solutions

Concentration term	Nominal concentration [mg/L]	Exact concentration [mg/L]
High (H)	0.1	0.086
Medium high (MH)	0.05	0.043
Medium low (ML)	0.01	0.0085
Low (L)	0.005	0.0043

3. Test soils

Five soils were used (see Table 7.1.3.1.2- 10). The soil types chosen were sand, sandy loam, silty clay loam and silty clay. All soils were air dried and sieved (2 mm) before use.

Table 7.1.3.1.2- 10: Soil characteristics

Soil	Type	Sand [%]	Silt [%]	Clay [%]	OM [%]	OC[a)] [%]	CEC	pH
[redacted]	silty clay	11	44	45	1.2	0.70	30.5	8.8
[redacted]	clay loam	26	46	28	3.0	1.74	16.9	6.9
[redacted]	sand	91	0	9	0.2	0.12	1.2	4.8
[redacted]	silty clay loam	9	62	29	1.2	0.70	6.6	7.0
[redacted]	sandy loam	62	21	17	1.4	0.81	11.1	6.9

a) not mentioned in the report but calculated from OM data given in report considering a factor 1/1.724 to convert %OM in %OC

B. STUDY DESIGN

1. Adsorption procedure

Triplicate 2 g samples of each soil (4 g for the Lakeland sand) for each of the four concentrations of test solution as well as the control solutions were placed in Teflon centrifuge tubes (nominal capacity 50 mL). The appropriate volume of each test solution was added to each of these tubes. See Table 7.1.3.1.2-11 for the soil weights and the volumes of the test solutions used. Each tube was sealed with a Teflon cap and mixed on a vortex mixer for 5 seconds. The tubes were then shaken in a horizontal position for 95 hours (preliminary work comparing 1, 2, and 3 days of equilibration time had shown that one day was sufficient to reach about 90% of the equilibrium adsorption, therefore, to be certain of reaching equilibrium, the tubes were allowed to be shaken for almost 4 days) on a mechanical shaker in an environmentally controlled chamber maintained at 25C.

The samples were removed from the shaker and centrifuged at 4000 rpm for 10 minutes. The supernatants were decanted into graduated cylinders and the volumes recorded. Triplicate 1.0 mL aliquots were removed for radioassay as described below. The soil from one tube from each triplicate set was allowed to air dry and was then analyzed by combustion radioassay to determine the recovery of the radioactivity. Duplicate control tubes containing no soil were treated in the same manner and were assayed to determine the recovery of the radioactivity from the test system. All of the solutions were stored refrigerated until they could be analysed to verify the integrity of the test material.

Table 7.1.3.1.2- 11: Soil weights and test solution volumes

Soil	Test solution volume [mL]	Soil weight [g]	Ratio (solution : soil)
[redacted]	10.0	2.00	5 : 1
[redacted]	8.0	2.00	4 : 1
[redacted]	8.0	4.00	2 : 1
[redacted]	8.0	2.00	4 : 1
[redacted]	6.0	2.00	3 : 1

2. Desorption procedures

Following adsorption, two samples from each triplicate were used to measure the desorption of the test material. Fresh aqueous calcium chloride (0.01 M) was added to each tube, using the same volume as

had been used for the adsorption phase. The tubes were resealed, vortexed and returned to the shaker. The mixtures were shaken for 46 hours.
The tubes were then centrifuged and the supernatants decanted into graduated cylinders. The volume of each supernatant was recorded and triplicate 1.0 mL aliquots were removed for radioassay. Fresh solutions of calcium chloride were added to the tubes which were sealed, vortexed, and shaken for another 24 hours. The tubes were centrifuged and the supernatants were decanted into graduated cylinders. The volume of each supernatant was recorded and triplicate 1.0 mL aliquots were removed for radioassay. The remaining soils were then allowed to air dry at room temperature. One soil from each of these duplicateswas then analysed by combustion radioassay.

3. Sample storage

All test solutions, adsorption and desorption supernatants were stored refrigerated at 2°C. Samples were allowed to warm to room temperature before being sampled for radioassay. After being air dried at room temperature, all soil samples were stored at room temperature in one ounce vials.

4. Analytical method

The concentration of 1,2,4-triazole in the solutions was determined by radioassay:
a) Liquid Scintillation Counting: Aliquots of 1.0 mL each were removed from the solutions, placed in polyethylene LSC vials, and diluted with 15 mL of Hydrofluor. Samples were counted for three rounds of 5 minutes each in Tri-Carb Liquid Scintillation Spectrometer. Counting efficiency was determined using the external standard channels ratio (ESCR).
b) Combustion Radioassay: The soil samples were combusted. Each combustion boat containing 0.2-0.3 g of soil was placed in the combustion tube of the oxidizer and burned at 900°C for 4 minutes in an oxygen atmosphere. The carbon dioxide produced was trapped in a polyethylene counting vial containing 15 mL of a premised scintillation solution. The vials were then counted as described above for liquid scintillation samples. The efficiency of the combustion process was determined by combusting a control sample spiked with a known amount of radioactivity.

5. Calculations

Adsorption and desorption isotherms were calculated by linear regression analysis of the adsorption or desorption data according to the Freundlich equation.

II. RESULTS AND DISCUSSION

A. MATERIAL BALANCE

The material balance was very good: radioactivity which was missing from the supernatants at the end of the adsorption phase was quantitatively recovered in the soils (99 ± 8%).

B. DEGRADATION OF TEST COMPOUND

1,2,4-Triazole was found to be stable to the conditions used for this investigation. All of the radioactivity recovered in the supernatants was unchanged 1,2,4-triazole. The identity of this material was verified by HPLC which showed an average of 102 ± 7% of the expected radioactivity was associated with the peak corresponding to triazole. Radioactivity was quantitatively recovered from the control tubes which did not contain soil (100 ± 2%).

C. FINDINGS

The recovery of radioactivity determined in the course of the study was calculated to be between 87.1% and 114.0%, with an average of 99%.
Summaries of the results of the study are presented in Table 7.1.3.1.2- 12 and Table 7.1.3.1.2- 13. The adsorption coefficients K_f ranging from 0.234 mL/g to 0.833 mL/g corresponded to K_{oc} values between

43 mL/g and 202 mL/g, with a mean value of 112 mL/g and a standard deviation of 58. The value of 202 mL/g resulting from the soil Lakeland was discarded as an outlier due to the low organic carbon content of the soil. The so calculated arith. mean value of 89 mL/g was accepted by the Dutch authority in the late 90ies and also later, in the EU review of propiconazole. Therefore, the geometric mean of 83 mL/g should be used for modelling purposes.

Table 7.1.3.1.2- 12: Determination of K_f and K_{foc} values of 1,2,4-triazole (adsorption)

Soil	r²	1/n	K_f [mL/g]	K_{foc} [mL/g]
[redacted]	0.996	0.897	0.833	120
[redacted]	0.997	0.827	0.748	43
[redacted]	0.997	0.885	0.234	202
[redacted]	0.998	0.922	0.722	104
[redacted]	0.997	1.016	0.720	89
Arith. mean[a)]				**89**
Geom. mean[a)]				**83**

a) Value of 202 mL/g resulting from the soil Lakeland was discarded as an outlier due to the low organic carbon content of the soil. The so calculated arith. mean value was accepted by the Dutch authority in the late 90ies and also later, in the EU review of propiconazole. Therefore, the **geometric** mean of **83 mL/g** should be used for modelling purposes

Table 7.1.3.1.2- 13: Determination of K_f and K_{foc} values of 1,2,4-triazole (desorption)

Soil	Desorption[a)]	r²	1/n	K_f [mL/g]	K_{foc} [mL/g]
[redacted]	1st desorption	0.999	0.968	2.130	306
	2nd desorption[a)]	0.995[a)]	1.015[a)]	7.93[a)]	1139[a)]
[redacted]	1st desorption	0.992	0.811	1.143	66
	2nd desorption[a)]	1.000[a)]	0.826[a)]	1.86[a)]	107[a)]
[redacted]	1st desorption	0.997	1.015	0.610	526
	2nd desorption[a)]	0.996[a)]	1.244[a)]	7.60[a)]	6551[a)]
[redacted]	1st desorption	0.995	0.843	0.816	117
	2nd desorption[a)]	0.996[a)]	0.876[a)]	2.04[a)]	293[a)]
[redacted]	1st desorption	0.998	0.972	1.065	131
	2nd desorption[a)]	0.998[a)]	1.010[a)]	3.49[a)]	430[a)]

a) Note: Values from 2nd desorption step are not valid. The concentrations of 1,2,4 triazole in the soils were lower than the results calculated from combustion analysis of the soil. Therefore, moisture occluded in the soil and containing dissolved 1,2,4 triazole contributed to the measured radioactivity

IV. CONCLUSIONS

The adsorption coefficients K_f for 1,2,4-triazole ranging from 0.234 mL/g to 0.833 mL/g corresponded to K_{oc} values between 43 mL/g and 202 mL/g, with a mean value of 112 mL/g and a standard deviation of 58. The value of 202 mL/g resulting from the soil [redacted] was discarded as an outlier due to the low organic carbon content of the soil. The so geometric mean of 83 mL/g should be used for modelling purposes.

CA 7.1.3.2 Aged sorption

Studies are not required under Commission Regulation (EU) No 283/2013 in accordance with Regulation (EC) No 1107/2009.

CA 7.1.4 Mobility in soil

CA 7.1.4.1 Column leaching studies

CA 7.1.4.1.1 Column leaching of the active substance

K_d and K_{oc} values of prothioconazole cannot be determined in batch equilibrium studies due to the instability of the compound in these systems. Therefore a column leaching test and an aged residue column leaching study were conducted to get more information concerning the leaching potential of prothioconazole. These studies were evaluated during the Annex I inclusion using the phenyl-labelled positions, and were accepted by the European Commission (EFSA Scientific Report (2007) 106, 1-98, 12 July 2007). The following studies are included in the Baseline Dossier:

Annex point / reference no.	Author(s)	Year	Document no.
Column leaching study			
KCA 7.1.4.1.1 /01	[redacted], K.	1999	M-011618-01-1
Aged residue column leaching			
KCA 7.1.4.1.1/02	[redacted], P.	2001	M-055836-02-1

For a better understanding the corresponding summaries of these studies as given in the Baseline Dossier are given below (grey coloured).

A summary of the adsorption behaviour of prothioconazole in soil is given in section CA 7.1.3.1.

- **Column leaching study**

Report:	**KCA 7.1.4.1.1 /01, [redacted], K., 1999**
Title:	Leaching behaviour of JAU 6476 formulated as 250 EC in soil (parent leaching)
Report No:	MR-088/99
Document No:	M-011618-01-1
Guidelines:	- SETAC Europe, Procedures for Assessing the Environmental Fate and Ecotoxicity of Pesticides, March 1995 Commission Directive 95/36/EC of 14 July 1995 amending Council Directive 91/414/EEC concerning the placing of plant protection products on the market, Official Journal of the European Communities No. L 172, 22/07/1995 BBA Guideline, Part IV, 4 2, 1986
GLP:	Yes

Test System: The leaching behaviour of JAU 6476 was investigated in four different soils (loamy sand, silt, sandy loam and silty clay loam) which are described in Table 7.1.4.1.1- 1. Phenyl-labelled JAU 6476, formulated as 250 EC, was applied at a concentration of 200 g a.s./ha onto 30 cm soil columns

and was irrigated for 2 days with 0.01 M $CaCl_2$ solution, corresponding to an amount of rainfall of 20 cm (Considering the sectional area of the column of 19.6 cm², the resulting theoretical amount of water was 393 mL). The leaching test was performed under aerobic conditions at 20°C in the dark.
The leachate was collected in 2 fractions of about 200 mL each and analysed for content of radioactivity by LSC measurement. After the leaching process, the soil columns were cut into five segments of about 6 cm each and analysed for content of radioactivity. Soil segments were extracted and analysed by TLC

Table 7.1.4.1.1- 1: Physical/chemical characteristics and biomass measurements of the soils used in the columns

Designation	[redacted]	[redacted] XXa	[redacted]	[redacted]
Origin	USA	Germany	Germany	USA
Soil type (USDA)	Loamy sand	Sandy loam	Silt	Silty clay loam
Textural analysis (USDA): 2000 - 50 µm, sand (%) 50 - 2 µm, silt (%) < 2 µm, clay (%)	 86.8 7.6 5.6	 72.4 22.6 5.0	 8.5 81.3 10.2	 12.4 48.0 39.6
pH value: $CaCl_2$ (0.01 M) H_2O	 6.0 7.0	 6.6 7.2	 6.8 7.1	 5.6 5.9
Organic C (%)	0.39	2.02	2.14	1.66
Cation exchange capacity (meq / 100 g soil)	5.0	8	15	18.5
Biomass at start of test mg microbial C / kg soil	98	396	643	314

Findings:

JAU 6476 and its metabolites showed a very low potential of leaching. Based on the applied radioactivity, the amount of radioactivity measured in the total leachate was 0.13% for the Byromville soil and < 0.05% for the other soils. Because of a radioactivity of << 1% of the applied radioactivity in the leachates no further investigations were performed.

After termination of the overhead irrigation between 88.4% (Byromville soil) and 97.9% (Stanley soil) of the applied radioactivity were recovered from the upper soil segments. Only in soil Byromville the amount of radioactivity translocated into the segment 2 (6 – 12 cm) was 8.7% of the applied radioactivity. The radioactivity in segments 2 of all other soils and in all lower segments of the soil columns (12 – 30 cm) was below 1% of the applied radioactivity. The amount of not extracted residues in the complete soil columns ranged between 30.5 and 36.3% of the applied radioactivity. The material balances are summarised in Table 7.1.4.1.1- 2. Calculations were performed using the computer software EXCEL 5.0. In general the program uses nine decimal places for its calculation. The results given are values rounded to two digits. Thus, rounding errors may occur if recalculations are made using the rounded figures.

Only those segments containing > 1% of the applied radioactivity were extracted and analysed by TLC. The unchanged parent compound JAU 6476 was found between 14.6% (Byromville soil) and 40.7% (Stanley soil) of the applied radioactivity. With one exception the main degradation product JAU 6476-desthio *(M04)* could be detected only in the first segments (15.4 – 28.0% of the applied radioactivity). In soil Byromville (loamy sand) 24.6% of the applied radioactivity could be detected in segment 1 (0 – 6 cm) and 7.5% in segment 2 (6 - 12 cm) as JAU 6476-desthio *(M04)*. A second degradation product, JAU 6476-S-methyl (M01) (5.5%, [redacted] – 11.2%, Byromville), was detected only in the residues of the first soil segments. The sum of all other detected degradation products (up to 5 substances) was between 3.3 and 6.3% of the applied radioactivity (of it not more than 0.05% in segment 2 for Byromville soil only). The results for the distribution of the active substance and the degradation products are summarised in Table 7.1.4.1.1- 3.

JAU 6476 degraded in the soil during the test period of two days very fast. JAU 6476 and its degradation products showed an extremely low tendency to be translocated in soil after leaching. Nearly the complete radioactivity applied onto soil columns remained in the upper soil segment (0 – 6 cm, Byromville soil 0 – 12 cm) after leaching. Because of the short half-life of JAU 6476, the very low total radioactive residues in the leachates (0.01 – 0.13% of the applied radioactivity) and no unchanged parent compound in the 2nd segment even in the Byromville soil (sand) the active substance JAU 6476 is to be classified as being immobile in soil.

Table 7.1.4.1.1- 2: Distribution of the radioactivity in leachates and soil segments (in percent of the applied radioactivity)

Soil	Leachate	Segment	Soil Extracted			Not extracted[a)]	Subtotal soil	Material balance
			Cold extract	Hot extract.	Subtotal extract.			
[redacted]		0 - 6 cm	45.80	7.88	53.68	34.67	88.41	
		6 – 12 cm	6.86	0.80	7.56	1.00	8.66	
		12 – 18 cm	0.62	0.07	0.69	0.24	0.93	
		18 – 24 cm	0.18	0.02	0.20	0.28	0.47	
		24 – 30 cm	0.12	0.01	0.13	0.02	0.15	
Total	*0.13*		*59.53*	*8.78*	*62.31*	*36.31*	*98.62*	*98.74*
[redacted]		0 - 6 cm	56.60	8.46	65.06	31.19	96.25	
		6 – 12 cm	0.69	0.06	0.75	0.04	0.79	
		12 – 18 cm	0.06	0.01	0.07	0.01	0.08	
		18 – 24 cm	0.03	0.01	0.04	0.01	0.05	
		24 – 30 cm	0.02	0.01	0.03	< 0.01	0.03	
Total	*0.01*		*57.40*	*8.55*	*65.95*	*31.25*	*97.20*	*97.21*
[redacted]		0 - 6 cm	59.66	7.16	66.82	30.83	97.75	
		6 – 12 cm	0.48	0.09	0.57	0.25	0.82	
		12 – 18 cm	0.12	0.01	0.13	0.11	0.24	
		18 – 24 cm	0.07	0.01	0.08	0.09	0.17	
		24 – 30 cm	0.06	< 0.01	0.06	0.07	0.13	
Total	*0.03*		*60.39*	*7.37*	*67.76*	*31.35*	*99.11*	*99.13*
[redacted]		0 - 6 cm	61.71	6.75	68.46	29.46	97.92	
		6 – 12 cm	0.40	0.02	0.42	0.21	0.63	
		12 – 18 cm	0.06	0.01	0.07	0.17	0.24	
		18 – 24 cm	0.03	0.01	0.04	0.11	0.15	
		24 – 30 cm	0.02	< 0.01	0.02	0.52	0.54	
Total	*0.01*		*62.22*	*6.79*	*69.01*	*30.47*	*99.48*	*99.48*

a) = not extracted + filter

Table 7.1.4.1.1- 3: Quantitation of JAU 6476 and metabolites in extracts of soil segments of leaching columns (in percent of the applied radioactivity)

Soil	Segment	Extracted radioactivity (%)	a.s.	M01	M04	Others
[redacted]	0 – 6 cm	53.74	14.63	11.18	24.59	3.34[c]
	6 – 12 cm	7.56	0	0	7.51	0.05[a]
[redacted]	0 – 6 cm	65.06	28.15	5.47	28.07	3.45[b]
	6 – 12 cm	0.75	n.a.	n.a.	n.a.	n.a.
[redacted]	0 – 6 cm	66.92	37.23	8.08	21.29	0.32[c]
	6 – 12 cm	0.57	n.a.	n.a.	n.a.	n.a.
[redacted]	0 – 6 cm	68.46	40.68	6.88	15.88	5.55
	6 – 12 cm	0.42	n.a.	n.a.	n.a.	n.a.

a.s. = JAU 6476
M01 = JAU 6476-S-methyl
M04 = JAU 6476-desthio

n.a. = not analysed

a) = 1 – 4 substances, incl. origin
b) = 1 – 3 substances, incl. origin
c) = 1 – 5 substances, incl. origin

- **Aged residue column leaching study**

Report:	**KCA 7.1.4.1.1 /02; [redacted]; P.; 2001**
Title:	Aged soil column leaching of JAU6476
Report No:	MR-09/99
Document No:	M-055836-02-1
Guidelines:	U.S. Environmental Protection Agency (U.S.EPA) 1982, Pesticide Assessment Guidelines, Subdivision N, Chemistry: Environmental Fate, Section 163 1, Leaching and Adsorption/Desorption Studies. U.S. EPA; [redacted]
GLP:	Yes

Test System: The leaching behaviour of JAU 6476 and its degradation products developed during ageing in soil was investigated in a sandy loam soil ([redacted], Georgia, USA) which is described in Table 7.1.4.1.1- 4. The soil was identical with the soil taken for the aerobic soil metabolism study of [redacted], 2001 (KCA 7.1.1.1.1/02). Phenyl-labelled JAU 6476 was applied at a concentration of 40 µg a.s./100 g dry soil, corresponding to the maximum recommended annual application rate of 200 g a.s./ha. The soil was incubated (aged) at ca. 20°C under aerobic conditions for a total of ca. 30 hours (ca. 1½ half-lives) after adjustment of the soil to ca. 75% of its 0.33 bar moisture.

Following incubation, the aged soil samples were applied onto the top of two 30 cm soil columns (identical soil). For this purpose the soil columns were equipped with a paper filter disc, onto which the incubated (aged) soil was transferred quantitatively (ca. 3.5 cm in height, corresponding to 100 g soil dry weight). Afterwards the columns were leached by overhead irrigation with a total of ca. 1000 mL of 0.01 M $CaCl_2$ solution (equal to 50.8 cm/m² of rainfall). The leaching period was five days. The leachate was collected in fractions of about 100 mL. The mobility of aged JAU 6476 residues through the soil was investigated by analysing extracts of the soil segments. After the leaching period the incubated (aged) soil was separated off (Segment 1) and the soil columns were cut into five segments (Segments 2 to 6) of ca. 6 cm each.

Identification of JAU 6476 and its metabolites was accomplished by co-chromatography of selected organic extracts from the aged soil and the segments of the soil columns with authentic non-radiolabelled reference compounds by TLC and HPLC.

Due to the low residues in the leachate samples (maximum individual value was 0.2%), these were only analysed for radioactivity concentration.

Table 7.1.4.1.1- 4: Soil characteristic

Origin	[redacted] Georgia, USA
Textural class (USDA)	Loamy sand
Textural analysis (USDA): 2000 - 50 µm, sand (%) 50 - 2 µm, silt (%) < 2 µm, clay (%)	 86.8 7.6 5.6
Organic C (%)	0.86
Organic matter (%) (org. C x 1.72)	1.5
pH (H_2O)	6.7
Cation exchange capacity (meq / 100 g soil)	4.29
Biomass at start of the test; without a (mg microbial C / kg dry soil)	70
Ca. 75% of 1/3 bar moisture (g water / 100 g soil dry weight)	6.27

Findings:

After the ageing period and prior to leaching approximately 72.4% of the applied radioactivity was recovered in the organic extract, and about 32.8% was determined as bound residue. Mineralisation and volatile organic compounds amounted to 0.3%. The total recovery of the two soil batches was in the mean 105.4% of the applied radioactivity.

After leaching the total radioactivity of the two soil batches was in the mean of 102.9% of the applied radioactivity. The total extractable radioactivity decreased from 72.4% of the applied radioactivity after ageing to 54.3% after leaching due to the formation of bound residues (46.9%). An average of 0.04% volatile radioactivity was formed during leaching. Only part of this material was represented by $^{14}CO_2$. The total radioactivity in the leachate accounted for only 1.1% of the applied radioactivity, and in no individual leachate fraction a radioactivity content of 0.2% of the applied radioactivity was measured. Therefore, these fractions were not analysed for parent compound or metabolites.

The radioactivity balances after incubation (ageing) and after the leaching period are given in Table 7.1.4.1.1- 5. The calculations were performed using the computer software EXCEL 97. In general, the program uses thirteen decimal places for its calculations. The results given were rounded to one or two digits. Thus, rounding deviations may occur if recalculations are made using the rounded figures.

Table 7.1.4.1.1- 5: Radioactivity balance after incubation (ageing) and after leaching (in percent of the applied radioactivity, mean of two values)

Period	Fraction	Soil			Volatiles			Material balance
		Extract.	Not-extract.	Sub-total soil	CO_2	Others	Sub-total volatiles	
After incubation (ageing)		72.4	32.8	105.1	0.29	0.01	0.30	105.4
After leaching	Soil:							
	Segment 1 (aged soil)	26.82	35.17	61.99				
	Segment 2	22.30	9.84	32.14				
	Segment 3	5.18	1.93	7.11				
	Segment 4			0.63				
	Segment 5			0.44				
	Segment 6			0.63				
	Subtotal soil	*54.30*	*46.94*	*102.94*	*< 0.1*	*< 0.1*	*< 0.1*	*102.94*
	Leachate:							
	Fraction 1							< 0.1
	Fraction 2							< 0.1
	Fraction 3							< 0.1
	Fraction 4							< 0.1
	Fraction 5							0.15
	Fraction 6							0.11
	Fraction 7							0.07
	Fraction 8							0.14
	Fraction 9							0.16
	Fraction 10							0.19
	Fraction 11							0.16
	Subtotal leachate							*1.05*
	Total (after leaching)	*54.30*	*46.94*	*102.94*	*< 0.1*	*< 0.1*	*< 0.1*	*104.3*

Concurrent to the unchanged parent compound (22.7% of the applied radioactivity) three metabolites were identified in the soil extract after ageing period and prior to leaching. One of them was present in amounts > 10% of the applied radioactivity, namely the main metabolite JAU 6476-desthio *(M04)* (31.8%). Two minor metabolites were identified as JAU 6476-S-methyl *(M01)* (8.1%) and JAU 6476-sulfonic acid *(M02)* (1.5%). Three minor metabolites (all < 4.0%) accounted for a total of 4.5%.

After leaching it was shown that by overhead irrigation of the soil column residual parent compound was not translocated, it decreased from 22.7% of the applied radioactivity prior to irrigation (after ageing) to 8.1% after the leaching process and was to its greatest part (6.7%) located in the top soil segment (aged soil), only 1.0% was detected in the soil segment below. None of the metabolites or CO_2 increased significantly to expense of the loss of extractable parent compound, which was obviously caused by the formation of bound residues.

The level of JAU 6476-desthio *(M04)*, which was the major metabolite after ageing (31.8%), was constant after the leaching process (32.1%). From this amount, the greatest part was located in the top soil layers (29.6%), whereby the second segment (16.6%) dominated over the top segment (12.5%). Obviously, as opposed to the parent compound, this metabolite showed a very slight tendency to move downwards the soil column. A similar behaviour was observed with the minor metabolite JAU 6476-S-methyl *(M01)* (8.1% after ageing), which remained in the top two segments (2.5 and 2.9%) after leaching as well. The other minor metabolite JAU 6476-sulfonic acid *(M02)* was detected after ca. 1½ half-lives of the parent ageing only at 1.5% of the applied radioactivity. The greatest part of the recovered amount (1.0%) was detected in the upper two soil segments after leaching (0.5 and 0.3%). Obviously, this metabolite did not play a significant role in column aged study.

The amounts of JAU 6476 and its metabolites in the soil extracts after the ageing period and after leaching are summarised in Table 7.1.4.1.1- 6.

Table 7.1.4.1.1- 6: Distribution of JAU 6476 and its metabolites in soil extracts after incubation (ageing) and after leaching (in percent of applied radioactivity, mean of two values)

Time after incubation	Segment	a.s.	M01	M02	M04	Unknown metabolites
29.5 hours (after ageing)		22.7	8.1	1.5	31.8	4.5[a)]
5 days (after leaching)	Segment 1 (aged soil)	6.63	2.74	0.49	12.07	2.09[b)]
	Segment 2	0.91	3.10	0.37	17.95	0.18[b)]
	Segment 3	0.31	n.d.	0.22	3.12	0.50[b)]
	Sum	*7.85*	*5.84*	*1.08*	*33.14*	*2.77*[b)]

a.s. = JAU 6476
M01 = JAU 6476-S-methyl
M02 = JAU 6476-sulfonic acid
M04 = JAU 6476-desthio

a) = sum of three metabolites, all ≤ 4.0% of the applied radioactivity
b) = sum of five metabolites, all ≤ 1.0% of the applied radioactivity

The distribution of JAU 6476, JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* in the soil column after leaching was used to estimate K_d and K_{oc} values for these three compounds.
Since the parent compound migrated out from the aged soil segment into the segment below only to a very limited extent, it has to be classified as immobile. The same result was obtained in the parent column leaching study by [redacted] (1999) (KCA 7.1.4.1.1 /01) using four soils (parent compound exclusively detected in the first soil column segment). A K_d value could not be determined for JAU 6476 in the parent leaching study due to non-saturated flow conditions applied in that study. K_d and K_{oc} values could neither be determined in batch equilibrium studies due to the instability of JAU 6476 in these systems. Instead a K_{oc} value was estimated using a HPLC-method ([redacted], 2001), the K_{oc} value varied with pH from 32 mL/g at pH 6 to 1383 mL/g at pH 2.5. The present aged leaching study offered the possibility to estimate a K_d value from the leaching behaviour of JAU 6476 in a soil column.
By convention, the middle of the soil segment which exhibits the highest concentration of a compound is usually taken as the migration path of that compound (plus the preceeding segments). In the case described here, this would result in a shortest (best) case migration path of 3.5 cm : 2 = 1.75 cm within the aged soil segment. Since in segment 2 small amounts of JAU 6476 were detected, it seemed reasonable to assume a migration path of longer than only half of the first segment. Taking ¾ of the length of the aged soil segment as a realistic case (corresponding to the middle of the second half of this segment) resulted in a migration path of 2.6 cm. The corresponding K_d value of 15.2 mL/g resulted in a calculated K_{oc} value of 1765 mL/g of JAU 6476 in loamy sandy soil.
The metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* migrated partly into lower segments. For these metabolites K_d values were estimated as well, and from these K_{oc} values were calculated. The estimated distribution coefficients (K_d) for the adsorption of the two metabolites through loamy sand were 5.8 mL/g for both JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)*. The estimated K_{oc} value derived from the K_d determinations was 678 mL/g for both metabolites. Separate adsorption/desorption studies with the JAU-S-methyl *(M01)* ([redacted], 1999 (KCA 7.1.3.1.2 /01)) and JAU 6476-desthio *(M04)* ([redacted], 1998 (KCA 7.1.3.1.2 /02)) yielded K_d values for the Byromville soil of 16 and 4 mL/g, respectively, which were in good accordance with the values from the aged leaching study. The respective K_{oc} values of 1974 and 523 mL/g from the above mentioned adsorption studies were also in the same range as the value of 678 mL/g for both compounds from the aged leaching study.

In conclusion, the parent compound is considered as immobile, and the metabolites JAU 6476-desthio *(M04)* and JAU 6476-S-methyl *(M01)* are considered as low mobile compounds through loamy sand soil. The estimated distribution coefficients, K_d and K_{oc} values from this study are listed in Table 7.1.4.1.1- 7.

Table 7.1.4.1.1- 7: Estimated adsorption coefficients for JAU 6476 and its metabolites

Compound	Estimated K_d (mL/g)	Estimated K_{oc} (mL/g)	Classification according to Briggs[1] (Mobility)
JAU 6476	15.2	1765	Immobile
JAU 6476-S-methyl *(M01)*	5.8	678	Low
JAU 6476-desthio *(M04)*	5.8	678	Low

CA 7.1.4.1.2 Column leaching of metabolites, breakdown and reaction products

No column leaching studies were performed for the major soil degradation products of prothioconazole. Their potential mobility can be determined from the adsorption/desorption studies described under CA 7.1.3.1.2.

CA 7.1.4.2 Lysimeter studies

No problems concerning the groundwater contamination are expected, as confirmed by the PEC_{gw} computer simulation for the active substance and the metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)*. Therefore, a lysimeter study with prothioconazole is not necessary.

CA 7.1.4.3 Field leaching studies

Field leaching studies have not been conducted for the active substance(s) as sufficient information can be derived from the existing studies.

CA 7.2 Fate and behaviour in water and sediment

In sterile aquatic systems at 50°C prothioconazole was stable at pH 7 and pH 9. Only at pH 4 a slight hydrolytic degradation of prothioconazole was observed after 168 hours incubation. The decline in the 168 hour sample was matched by an increase of the metabolite JAU 6476-desthio *(M04)* (5.3 % AR at study end). The DT_{50} of prothioconazole at 50°C was calculated to be > 1 year at pH 7 and pH 9 and about 120 days at pH 4. The DT_{50} of prothioconazole at 25°C was estimated by extrapolation of the 50°C data and was found to be more than one year at any environmental pH. It is concluded that the hydrolytic breakdown will not contribute to the degradation of prothioconazole in the environment.
JAU 6476-desthio *(M04)* was stable in sterile aquatic systems at 25°C at pH 5, pH 7 and pH 9. No hydrolytic degradation was observed. The resulting extrapolated half-lives were in the range of one to several years.

The photolysis behaviour of prothioconazole was studied in sterile aqueous solution at pH 7. The compound was completely photodegraded during the experiment. The mean experimental half-life was 47.7 hours, corresponding to a predicted environmental half-life under solar summer conditions of Phoenix, AZ, in June of 71 days and for conditions at Athens in June of 11 days. JAU 6476-desthio *(M04)* was identified as main degradation product at a maximum level of 56% of the applied

[1] [redacted] (1973)
A simple relationship between soil adsorption of organic chemicals and their octanol/water partition coefficients
Proc. 7th British Insecticide and Fungicide Conference, Nottingham/UK, 83-86, 1973

radioactivity. Two further major degradation products were identified as JAU 6476-thiazocine *(M12)* at 15% and 1,2,4 triazole *(M13)* at 12% of the applied radioactivity. It is demonstrated that photolysis is a dominant process of degradation in aqueous environment if prothioconazole is exposed to sunlight. Therefore, it is concluded that the solar radiation will contribute to the degradation of prothioconazole under environmental conditions.

The UV-VIS absorption of JAU 6476-desthio *(M04)* in pure water showed a maximum at 197 nm. From the UV absorption and the kinetic results a quantum yield Φ of 0.00445 was calculated. The resulting quantum yield and the UV absorption were used to estimate the environmental half-life of JAU 6476-desthio *(M04)* concerning direct photodegradation in water by different simulation models. The results of model studies indicate that the contribution of the direct photodegradation in water to the overall elimination of JAU 6476-desthio in the environment is not to be expected.
For JAU 6476-thiazocine *(M12)* it was shown that this metabolite will not be observed under environmentally relevant conditions in significant amounts. The metabolite 1,2,4 triazole *(M13)* showed no adsorption above 290 nm. For these reasons, no further investigations on the photolytic degradation in sterile solutions is regarded necessary for both metabolites.

The UV-absorption data in the environmentally relevant pH range showed that 1,2,4-triazole *(M13)* dissolved in aqueous solution does not absorb any light at wavelengths above 290 nm. The determination of the quantum yield of direct photodegradation of 1,2,4 triazole in order to estimate the environmental half-life makes no sense in this case, because no contribution of the direct photodegradation to the overall elimination of 1,2,4 triazole in the aqueous environment is to be expected. Therefore further investigations with 1,2,4-triazole concerning the photolytic behaviour in the aquatic environment are not necessary.

In <u>surface water</u> under aerobic conditions in the dark in the laboratory, prothioconazole was moderately degraded at low concentration level and did not show significant degradation at high concentration level in surface water under aerobic conditions in the dark in the laboratory. Formation of carbon dioxide was insignificant during the entire incubation period (up to 0.5% AR at DAT-1). One degradation product, JAU 6476-desthio *(M04)*, was identified with the maximum amounts of 41.9 and 29% AR in samples with low and high concentration, respectively.
The calculated best fit half-lives for prothioconazole were 89.2 and > 1000 days for low and high concentrations, respectively). For the major metabolite JAU 6476-desthio *(M04)* best fit half-lives of > 1000 and 258.7 days have been calculated for the low and the high concentrations, respectively. An overview of the data is given in Table 7.2- 1:

Table 7.2- 1: Summary of kinetic endpoints of prothioconazole and JAU 6476-desthio *(M04)* in aerobic surface water

Temp. [°C]	Surface Water	Concentration [µg/L]	Annex Point / Reference No	Kinetic model[a)]	DT_{50} [days]	DT_{90} [days]
Prothioconazole						
19.3	[redacted]	10	KCA 7.2.2.2 /01 & KCA 7.2.2.2 /02	DFOP	89.2	518
	[redacted]	100	KCA 7.2.2.2 /01 & KCA 7.2.2.2 /02	DFOP	> 1000	> 1000
JAU 6476-desthio *(M04)*						
19.3	[redacted]	10	KCA 7.2.2.2 /02	SFO	> 1000	> 1000
		100	KCA 7.2.2.2 /02	SFO	258.7	859.3

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

The degradation behaviour of prothioconazole in two different water/sediment systems was investigated under aerobic conditions. Prothioconazole rapidly dissipated in both systems. The evolution of $^{14}CO_2$ increased continuously until termination of the experiment. On the other hand, mineralisation of the triazole-label (1.1 to 1.9% AR at study end) was much slower than of the phenyl-label (14.7 to 29% AR at study end). More than 12 metabolites were formed and five of them were identified. The major metabolites (> 10%AR or > 5%AR at 2 or more sequential sampling points or > 5%AR increasing at the study end) were JAU 6476-S-methyl *(M01)*, JAU 6476-triazolinone *(M03)*, JAU 6476-desthio *(M04)*, 1,2,4-triazole *(M13)* and JAU 6476-triazolylketone *(M42)*. Amongst these metabolites, JAU 6476-desthio *(M04)*, 1,2,4-triazole *(M13)* and JAU 6476-triazolylketone *(M42)* were detected in the water layer as major ones. In the sediment extracts JAU 6476-S-methyl *(M01)*, JAU 6476-desthio *(M04)* 1,2,4-triazole *(M13)* and JAU 6476-triazolylketone *(M42)* were found as major metabolites.

The proposed metabolic pathway of prothioconazole in aquatic systems is shown in Figure 7.2-1.

Updated kinetic evaluations resulted half-lives for trigger and for modelling evaluations.
An overview of the estimates half-lives (dissipation or degradation DT_{50}) for prothioconazole and its major aquatic metabolites JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)* for trigger evaluation and modelling purpose are given in Table 7.2- 2 to Table 7.2- 4. For the metabolite 1,2,4-triazole *(M13)* the evaluation for the half-lives for trigger and modelling evaluation was not possible.

Table 7.2- 2: Summary of estimated half-lives (dissipation or degradation DT_{50}) for prothioconazole for trigger evaluation and modelling purpose

System	Label	Annex Point / Reference No.	Trigger evaluation			Modelling purpose	
			Kinetic model[a)]	DT_{50} [days]	DT_{90} [days]	Kinetic model[a)]	DT_{50} [days]
Total system (degradation)							
[redacted]	phenyl	KCA 7.2.2.3 /03	FOMC	1.45	27.6	SFO[b)]	83.1
	triazole	KCA 7.2.2.3 /03	DFOP	0.91	96.7	SFO[c)]	29.1
geometric mean:				*1.15*			*49.2*
[redacted]	phenyl	KCA 7.2.2.3 /03	DFOP	1.20	16.5	SFO[c)]	4.97
	triazole	KCA 7.2.2.3 /03	DFOP	1.33	11.3	SFO[c)]	3.40
geometric mean:				*1.26*			*4.11*
overall geometric mean:				*1.20*			*14.2*
Water (dissipation)							
[redacted]	phenyl	KCA 7.2.2.3 /03	HS	0.48	5.09	SFO[d)]	1.53
	triazole	KCA 7.2.2.3 /03	DFOP	0.27	5.56	SFO[d)]	1.68
geometric mean:				*0.36*			*1.60*
[redacted]	phenyl	KCA 7.2.2.3 /03	FOMC	0.56	2.86	SFO[b)]	0.861
	triazole	KCA 7.2.2.3 /03	FOMC	0.71	3.15	SFO[b)]	0.949
geometric mean:				*0.63*			*0.90*
overall geometric mean:				*0.48*			*1.20*
Sediment (dissipation)							
[redacted]	phenyl	KCA 7.2.2.3 /03	SFO	60.2	200	SFO	60.2
	triazole	KCA 7.2.2.3 /03	SFO	76.2	253	SFO	76.2
geometric mean:				*67.7*			*67.7*
[redacted]	phenyl	KCA 7.2.2.3 /03	FOMC	7.36	343	SFO[c)]	106
	triazole	KCA 7.2.2.3 /03	DFOP	8.36	181	SFO[c)]	84.7
geometric mean:				*7.84*			*94.7*
overall geometric mean:				*23.05*			*80.1*

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) back calculated from FOMC
c) back calculated from DFOP
d) back calculated from HS

Table 7.2- 3: Summary of estimated half-lives (dissipation or degradation DT_{50}) for JAU 6476-S-methyl *(M01)* for trigger evaluation and modelling purpose

System	Label	Annex Point / Reference no.	Trigger evaluation			Modelling purpose	
			Kinetic model[a)]	DT_{50} [days]	DT_{90} [days]	Kinetic model[a)]	DT_{50} [days]
Total system (degradation)							
[redacted]	phenyl	KCA 7.2.2.3 /03	SFO[b)]	180	597	SFO[b)]	180
	triazole	KCA 7.2.2.3 /03	SFO[b)]	134	445	SFO[b)]	134
geometric mean:				*155*			*155*
[redacted]	phenyl	KCA 7.2.2.3 /03	SFO[b)]	44.8		SFO[b)]	44.8
	triazole	KCA 7.2.2.3 /03	SFO[b)]	39.5		SFO[b)]	39.5
geometric mean:				*42.0*			*42.0*
overall geometric mean:				*80.7*			*80.7*
Water (dissipation)							
[redacted]	phenyl	KCA 7.2.2.3 /03	DFOP	3.99	30.7	SFO[c)]	9.24
	triazole	KCA 7.2.2.3 /03	SFO	9.17	30.5	SFO	9.17
geometric mean:				*6.05*			*9.20*
[redacted]	phenyl	KCA 7.2.2.3 /03	SFO	11.6	38.6	SFO	11.6
	triazole	KCA 7.2.2.3 /03	SFO	11.9	39.4	SFO	11.9
geometric mean:				*11.7*			*11.7*
overall geometric mean:				*8.33*			*10.4*
Sediment (dissipation)							
[redacted]	phenyl	KCA 7.2.2.3 /03	no evaluation possible			no evaluation possible	
	triazole	KCA 7.2.2.3 /03	no evaluation possible			no evaluation possible	
geometric mean:				--			--
[redacted]	phenyl	KCA 7.2.2.3 /03	SFO	59.3	197	SFO	59.3
	triazole	KCA 7.2.2.3 /03	SFO	48.4	161	SFO	48.4
geometric mean:				*53.6*			*53.6*
overall geometric mean:				*53.6*			*53.6*

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) fit together with parent
c) back calculated from DFOP

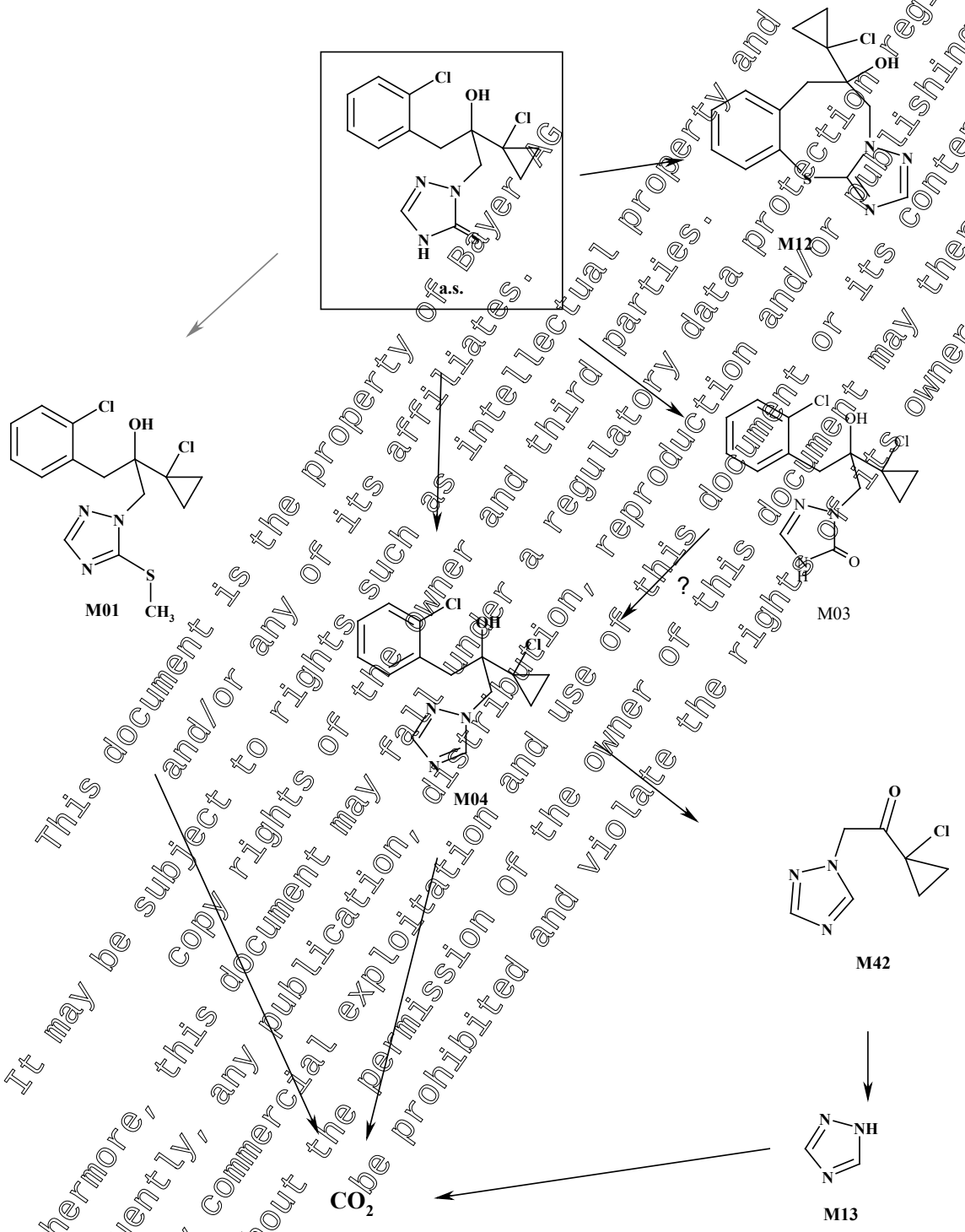
Table 7.2- 4: Summary of estimated half-lives (dissipation or degradation DT_{50}) for JAU 6476-desthio *(M04)* for trigger evaluation and modelling purpose

System	Label	Annex Point / Reference no.	Trigger evaluation			Modelling purpose	
			Kinetic model[a)]	DT_{50} [days]	DT_{90} [days]	Kinetic model[a)]	DT_{50} [days]
Total system (degradation)							
[redacted]	phenyl	KCA 7.2.2.3 /03	--	--	--	--	--
	triazole	KCA 7.2.2.3 /03	SFO[b)]	75.8	252	SFO[b)]	75.8
geometric mean:				*75.8*			*75.8*
[redacted]	phenyl	KCA 7.2.2.3 /03	SFO[b)]	42.6		SFO[b)]	42.6
	triazole	KCA 7.2.2.3 /03	SFO[b)]	39.1		SFO[b)]	39.1
geometric mean:				*40.8*			*40.8*
overall geometric mean:				*55.6*			*55.6*
Water (dissipation)							
[redacted]	phenyl	KCA 7.2.2.3 /03	FOMC	2.38	35.0	SFO[c)]	14.0
	triazole	KCA 7.2.2.3 /03	DFOP	3.91	44.8	SFO[d)]	13.5
geometric mean:				*3.05*			*13.7*
[redacted]	phenyl	KCA 7.2.2.3 /03	SFO	27.7	92.0	SFO	27.7
	triazole	KCA 7.2.2.3 /03	SFO	30.6	101.7	SFO	30.6
geometric mean:				*29.1*			*29.1*
overall geometric mean:				*9.42*			*20.0*
Sediment (dissipation)							
[redacted]	phenyl	KCA 7.2.2.3 /03	no evaluation possible			no evaluation possible	
	triazole	KCA 7.2.2.3 /03	no evaluation possible			no evaluation possible	
geometric mean:				--			
[redacted]	phenyl	KCA 7.2.2.3 /03	SFO	62.0	206	SFO	62.0
	triazole	KCA 7.2.2.3 /03	SFO	52.3	174	SFO	52.3
geometric mean:				*57.0*			*57.0*
overall geometric mean:				*57.0*			*57.0*

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) fit together with parent
c) back calculated from FOMC
d) back calculated from DFOP

In a water/sediment study under anaerobic conditions the DT_{50} values for prothioconazole were calculated to be 2.5 days for the water layer and 73 days for the entire system. JAU 6476-S-methyl *(M01)* was identified as major metabolite in the water layer and the sediment.

Figure 7.2-1: **Proposed degradation pathway of prothioconazole in aquatic systems (major degradation products are mentioned in bold letters)**



a.s. = prothioconazole
M01 = JAU 6476-S-methyl
M03 = JAU 6476-triazolinone
M04 = JAU 6476-desthio
M12 = JAU 6476-thiazocine
M13 = 1,2,4-triazole
M42 = JAU 6476-triazolylketone

CA 7.2.1 Route and rate of degradation in aquatic systems (chemical and photochemical degradation)

CA 7.2.1.1 Hydrolytic degradation

The hydrolytic route and rate of degradation of prothioconazole in buffers under sterile conditions in the dark in the laboratory were evaluated during the Annex I and was accepted by the European Commission (EFSA Scientific Report (2007) 106, 1-98, 12 July 2007). The following study is included in the Baseline Dossier:

Annex Point / Reference No	Author(s)	Year	Document No
KCA 7.2.1.1 /01	[redacted], K.	1998	M-005117-01-1

For a better understanding the corresponding summary of this study as given in the Baseline Dossier is given below (grey coloured). Changes in these evaluations - based on e.g change of trigger values in the new regulation EC no. 1107/2009[1] - are distinguished in black to show them as revised information.

One additional study on the hydrolytic behaviour of the major metabolite JAU 6476-desthio *(M04)* is submitted within this Supplemental Dossier for the prothioconazole renewal of approval. A summary of the hydrolytic behaviour of JAU 6476-desthio in water is given in KCA 7.2.1.1/02.

[1] Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC
Official Journal of the European Union L 309, 24.11.2009

Report:	**KCA 7.2.1.1 /01; [redacted], K.; 1998**
Title:	Hydrolysis of [phenyl-UL-^{14}C]JAU 6476 in sterile aqueous buffer solutions
Report No:	MR-623/98
Document No:	M-005117-01-1
Guidelines:	- Commission Directive 95/36/EC of 14 July 1995 amending Council Directive 91/414/EEC concerning the placing of plant protection products on the market, Official Journal of the European Communities No. L 172, 22/07/1995 - Commission Directive 94/37/EC of 22 July 1994 amending Council Directive 91/414/EEC concerning the placing of plant protection products on the market, Official Journal of the European Communities No. L 194 , 29/07/1994 - Official Journal of the European Communities No. L 383 A, EEC method C.7, December 29, 1992 - SETAC-Europe: Procedures for Assessing the Environmental Fate and Ecotoxicity of Pesticides, March 1995 - U. S. Environmental Protection Agency (U.S. EPA). 1982. Pesticide Assessment Guidelines, Subdivision N, Chemistry: Environmental Fate, Section 161 1, Hydrolysis. U.S. EPA, [redacted] - U. S. Environmental Protection Agency (U.S. EPA). 1985. Pesticide Assessment Guidelines, Subdivision N, Chemistry: Environmental Fate, Section 161 1, Standard Evaluation Procedure for Hydrolysis Studies. U.S. EPA, [redacted] - U. S. Environmental Protection Agency (U.S. EPA). 1989. Pesticide Assessment Guidelines, Subdivision N, Chemistry: Environmental Fate, Section 161 1, Acceptance Criteria for Hydrolysis Studies. U.S. EPA [redacted] - U. S. Environmental Protection Agency (U.S. EPA). 1993. Pesticide Reregistration Rejection Rate Analysis - Environmental Fate. U.S. EPA, [redacted] EPA 738 R 93 010, September 1993 - U. S. Environmental Protection Agency (U.S. EPA). 1995. Pesticide Reregistration Rejection Rate Analysis – Environmental Fate, Follow up guidance for submission of raw date. U.S. EPA, [redacted], EPA 738 R 95 015, April 1995
GLP:	Yes

Test System: The hydrolysis of JAU 6476 was studied in 0.01 M buffer solutions adjusted to pH 4 (acetate buffer), pH 7 (TRIS buffer) and pH 9 (borate buffer). The test solutions were prepared with phenyl-labelled parent compound at a concentration of about 4 mg/L (3.6 – 3.9 mg/L). The solutions were incubated for a maximum period of 7 days under sterile conditions in the dark at 50°C, and the sampling intervals were 0, 6, 24, 48, 72, 96 and 168 hours. For pH 9 additional samples were taken after 1 and 2.5 hours.

Findings:
In the 50°C test JAU 6476 was found to be stable at pH 7 and 9 while only very low degradation of JAU 6476 was observed at pH 4. At pH 7 and pH 9 no significant appearance of degradation products was observed at any time of sampling. 99.9% (mean value at pH 7) and 98.9% (mean value at pH 9) of the applied radioactivity was representing the unchanged parent compound based on HPLC analysis of all samples. The remaining radioactivity was mainly representing the metabolite JAU 6476-desthio *(M04)* (about 2%) which was already present at comparable levels in the applied substance. Only at pH 4 a slight hydrolytic degradation of JAU 6476 was observed after 168 hours of incubation. The decline of JAU 6476 in the 168 hour sample was matched by an increase of the metabolite JAU 6476-desthio *(M04)* (5.3%) and the fraction other metabolites (4.2%). Table 7.2.1.1- 1 summarises these results,

which are values rounded to one decimal place. Thus rounding errors may occur if recalculations are made using these rounded values.

The DT_{50} of JAU 6476 at 50°C was calculated to be > 1 year at pH 7 and pH 9 and about 120 days at pH 4. The DT_{50} of JAU 6476 at 25°C was estimated by extrapolation of the 50°C data and found to be more than one year at any environmental pH. It is concluded that the hydrolytic breakdown is expected not to contribute to the degradation of JAU 6476 in the environment.

Table 7.2.1.1- 1: Hydrolysis of JAU 6476 in three buffer solutions at 50°C in percent of applied radioactivity (mean of two values)

Buffer solution	Sampling interval (hours)	a.s.	M04	Other metabolites	Recovery
pH 4	0	94.5	2.2	1.5	97.1
	6	95.9	2.5	4.0	102.4
	24	101.2	3.0	1.5	105.7
	48	98.6	3.2	1.6	103.5
	72	99.3	3.3	1.9	104.5
	96	102.1	3.4	1.2	106.7
	168	93.3	5.3	4.2	102.7
pH 7	0	95.6	2.0	0.6	99.6
	6	99.4	1.5	0.5	101.4
	24	101.8	1.4	1.3	104.4
	48	99.1	2.0	1.3	102.4
	72	102.6	1.6	1.1	105.2
	96	101.3	2.0	1.9	105.2
	168	99.9	1.9	0.6	102.5
pH 9	0	97.7	1.6	0.5	99.7
	1	98.0	2.2	1.2	101.4
	2.5	98.3	1.7	1.5	101.5
	6	97.5	2.2	1.6	101.3
	24	99.6	2.1	1.1	102.8
	48	99.4	2.2	1.1	102.7
	72	100.6	2.4	1.3	104.2
	96	100.7	2.3	1.9	104.9
	168	98.3	2.4	1.7	102.4

a.s. = JAU 6476
M04 = JAU 6476-desthio

New study submitted for Annex I Renewal
Justification for including this study in the Annex I Renewal Dossier: This study was submitted to cover the new guideline requirement on the major degradation product JAU 6476-desthio *(M04)*.

Report:	**KCA 7.2.1.1 /02; [redacted], E.; 1993**
Title:	SXX 0665: Hydrolysis in buffers
Report No:	PF3882
Document No:	M-008584-01-3
Guidelines:	EPA Pesticide Assessment Guidelines, Subdivision N. Chemistry: Environmental Fate, Section 161-1 (1982)
GLP:	Yes
Justification:	New data / guideline requirement:

Executive Summary

The hydrolytic behaviour of phenyl-labelled JAU 6476-desthio *(M04)* was studied in sterile 0.01 M buffer solutions at pH 5 (acetate buffer), pH 7 (phosphate buffer) and pH 9 (borate buffer) at 25°C in the dark and for a maximum duration of 30 days.
The test compound was applied at 5.0 mg/L in the acetate buffer (pH 5) and at 3.7 mg/L in the phosphate (pH 7) and borate buffer (pH 9).

Mean material balances ranged from 98.5 to 107.8% of applied radioactivity [AR] in buffer pH 5, 95.0 to 101.9%AR in buffer pH 7 and 96.3 to 97.4%AR in pH 9.
No general decrease in the radioactivity level of the samples was determined with progressing test period (e.g. as a result of the formation of volatile products of hydrolysis). No degradation products were determined in the course of hydrolysis over 30 days.

The resulting extrapolated half-lives were in the range of one to several years.
Considering the low degradation rates at environmental pH and temperature values, the hydrolysis reaction is expected not to contribute to the degradation of JAU 6476-desthio in the environment.

I. MATERIALS AND METHODS

A. MATERIALS

1. Test Item

phenyl-labelled JAU 6476-desthio *(M04)*
Specific Activity: 3.01 MBq/mg
Radiochemical Purity: 99.3%
Chemical Purity: 99.2%

2. Test Systems

The tests were carried out in 0.01 M buffer solutions. The following buffer solutions were used (see Table 7.2.1.1-3):

Table 7.2.1.1- 2: Buffer solutions

pH	Buffer
5	acetate buffer
7	phosphate butter
9	borate buffer

B. STUDY DESIGN

1. Experimental Conditions

In order to rule out the influence of biodegradation during hydrolysis, the buffer solutions and all vessels, pipettes etc. which came into contact with them or the test solutions were sterilized. The test solutions were prepared and allocated to the individual incubation vessels on a sterile bench.
For preparation of the application solution phenyl-labelled JAU 6476-desthio was dissolved in 1.54 mL of acetonitrile. The radioactivity level of the solution which was obtained was determined by liquid scintillation measurement (LS).
Approx. 400 µL of the application solution was transferred to each of three 250 mL conical flasks on the sterile bench. Subsequently, the solvent was evaporated in a gentle stream of nitrogen, 100 mL of each buffer solution was added to the residue, and these samples were dissolved by 30-minute treatment in an ultrasonic bath. Subsequently, the homogeneity and concentrations of the 3 test solutions were tested by LS measurement of 3 aseptically taken 10 µL samples of each solution. The results are listed in Table 7.2.1.1- 3.

Table 7.2.1.1- 3: Concentrations of the test solutions

Test solution	0.01 M buffer pH	Radioactivity [kBq/100 µL]	JAU 6476-desthio *(M04)* content [mg/L]
S	4.97	1.50[a)]	5.00
N	7.02	1.11[a)]	3.67
B	8.99	1.12[a)]	3.72

a) measured values of 3 samples

5.0 mL portions of each of the test solutions S, N and B were transferred under sterile conditions to sets of 17 incubation vessels (10 mL beaded rim glass vessels)
5 ml of the buffer solutions without active substance was incubated in vessels S17, N17 and B17. These samples were only used to monitor the sterile procedure. The rest of the test solutions was transferred to vessels no. 18.
Vessels S0, N0 and B0 were used as blank samples and kept in a refrigerator at approx. 4 °C. Samples S1, N1 and B1 were tested for sterility and pH at the start of the test. Samples nos. 2 to 18 were incubated in the water bath of the cryostat in the dark at 25°C.

2. Sampling

At each sampling time 2 samples per buffer were taken and subsequently analysed. The pH and sterility were checked in samples taken specially for these tests. The sampling times were distributed evenly over the intended maximum test period of 30 days (DAT 0, 3, 7, 14, 20, 24 and 30).

3. Analytical Procedures

Substance-specific analysis was carried out on the basis of two independent chromatographic methods:
Method A: Reversed phase high performance liquid chromatography with HP 1090 (Hewlett Packard), fitted with diode array detector and flowthrough radioactivity detector RAYTEST Ramona 4 with solid scintillator cell.
Method B: Thin-layer chromatography by separation on silica gel (20 x 20 cm, 0.25 mm, Merck 60, F 254).

II. RESULTS AND DISCUSSION

A. EXTRACTION AND QUANTIFICATION OF RADIOACTIVITY IN SOIL SAMPLES

No general decrease in the radioactivity level of the samples was determined with progressing test period (e.g. as a result of the formation of volatile products of hydrolysis). No degradation products were determined in the course of hydrolysis over 30 days.

B. MATERIAL BALANCE

Mean material balances ranged from 98.5 to 107.8% of applied radioactivity [AR] in buffer pH 5, 95.0 to 101.9%AR in buffer pH 7 and 96.3 to 97.4%AR in pH 9. The radioactivity balance is summarised in Table 7.2.1.1- 4 to Table 7.2.1.1- 6.

Table 7.2.1.1- 4: Radioactivity balance of the hydrolysis of JAU 6476-desthio *(M04)* in acetate buffer pH 5

Sample code	Incubation time [day]	Radioactivity recovered [%]	
S0	0	100	
S1	0	-	
S2	3	118.7	107.8
S3	3	96.8	
S4	7	110.4	104.7
S5	7	99.0	
S6	14	94.3	98.5
S7	14	102.7	
S8	14	-	
S9	20	97.3	99.1
S10	20	100.9	
S11	24	08.8	100.5
S12	24	102.1	
S13	30	99.1	101.4
S14	30	103.6	
S16	30	-	
S17	30	-	

Table 7.2.1.1- 5: Radioactivity balance of the hydrolysis of JAU 6476-desthio *(M04)* in phosphate buffer pH 7

Sample code	Incubation time [day]	Radioactivity recovered [%]	
N0	0	100	
N1	0	-	
N2	3	95.2	97.6
N3	3	99.9	
N4	7	96.5	97.9
N5	7	99.2	
N6	14	98.6	99.4
N7	14	100.2	
N8	14	-	
N9	20	94.6	95.0
N10	20	95.4	
N11	24	104.3	101.9
N12	24	99.4	
N13	30	99.0	97.8
N14	30	96.6	
N16	30	-	
N17	30	-	

Table 7.2.1.1- 6: Radioactivity balance of the hydrolysis of JAU 6476-desthio *(M04)* in borate buffer pH 9

Sample code	Incubation time [day]	Radioactivity recovered [%]	
B0	0	100	
B1	0	-	
B2	3	96.7	96.6
B3	3	96.4	
B4	7	97.3	97.4
B5	7	97.5	
B6	14	95.9	96.7
B7	14	97.4	
B8	14	-	
B9	20	96.0	96.3
B10	20	96.6	
B11	24	96.9	97.1
B12	24	97.3	
B13	30	96.6	96.8
B14	30	97.0	
B16	30	-	
B17	30	-	

C. DEGRADATION

No degradation was observed statistically at any of the three tested pH values during the observed period of hydrolysis.

Extremely low rate constants, very low coefficients of correlation and determination, and as a result very long, severely fluctuating half-lives were determined by linear regression. Due to the relatively uncertain extrapolation, the specification of an exact half-life does not seem appropriate. However, on the basis of the data the half-life can be estimated as not less than a year to several years. This evaluation is supported by the fact that practically no products were determined after 30 days hydrolysis.

III. CONCLUSIONS

Due to the low degradation rate in the pH and temperature ranges which are relevant for the environment, hydrolysis should not be significant during the degradation of JAU 6476-desthio *(M04)* in the environment

CA 7.2.1.2 Direct photochemical degradation

The photolytic routes and rates of degradation of prothioconazole and its major degradation product JAU 6476-desthio *(M04)*, JAU 6476-thiazocine *(M12)* and 1,2,4-triazole *(M13)* were evaluated during the Annex I inclusion and were accepted by the European Commission (EFSA Scientific Report (2007) 106, 1-98, 12 July 2007). The following studies are included in the Baseline Dossier:

Annex Point / Reference No	Author(s)	Year	Document No
Prothioconazole			
KCA 7.2.1.2 /01	[redacted], E.	2001	M-051279-01-1
KCA 7.2.1.2 /02	[redacted], M.; [redacted], W.	2001	M-064326-01-1
JAU 6476-desthio *(M04)*			
KCA 7.2.1.2 /03	[redacted], E.	1993	M-008540-01-1
JAU 6476-thiazocine *(M12)*			
KCA 7.2.1.2 /04	[redacted], H.	2001	M-088260-01-1
KCA 7.2.1.2 /05	[redacted], H.	2001	M-088249-01-1
1,2,4-triazole *(M13)*			
KCA 7.2.1.2 /06	[redacted], B.	2000	M-033175-01-1

No additional studies are submitted within this Supplemental Dossier for the prothioconazole renewal of approval. In the Baseline Dossier it has been argued that since formation of JAU 6476-thiazocine *(M12)* is much slower compared to the degradation of prothioconazole/JAU 6476-S-methyl *(M01)* in water /sediment system, this metabolite had not to be addressed. However, this has changed since the half-life of prothioconazole in the new study "Mineralisation in surface water" is much longer than the formation of JAU 6476-thiacozine in the aquatic photolysis. Therefore, the metabolite JAU 6476-thiazocine is included in the aquatic risk assessment.

In addition, updated kinetic evaluations of the aquatic photolysis of prothioconazole and its metabolites in aquatic buffer solutions have been performed according FOCUS Guidance 2014. The kinetic evaluation is summarised in KCA 7.2.1.2 /07.
A summary of the route and rate of degradation of prothioconazole in water and sediment is given in section CA 7.2 and Figure 7.2-1.

- **Prothioconazole**

New study submitted for Annex I Renewal
Justification for including this study in the Annex I Renewal Dossier: The objective of this study is the kinetic evaluation of the aquatic photolysis of prothioconazole and its metabolites (KCA 7.2.1.2 /02). The evaluation was conducted to derive kinetic parameters according to FOCUS Guidance 2014.

Report:	**KCA 7.2.1.2 /07; [redacted], A.C.; [redacted], C.; 2015**
Title:	Prothioconazole (PTZ) Kinetics Aquatic Photolysis Lab - Kinetic evaluation of the photolysis of prothioconazole and its metabolites in sterile aqueous buffer under laboratory conditions
Report No:	EnSa-15-0265
Document No:	M-532628-01-1
Guidelines:	FOCUS, 2014: Generic guidance for Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration, Version: 1.1; Date: 18 December 2014
GLP:	No (calculation)
Justification:	New data / guideline requirement: Kinetic analysis of the aquatic photolysis of prothioconazole and its metabolites JAU 6476-desthio *(M04)* , JAU 6476-thiazocine *(M12)* and 1,2,4-triazole *(M13)* in sterile aqueous buffer solutions under light conditions

Executive Summary

The purpose of this study was to estimate normalised (20°C, pF 2) degradation times (DT_{50}) (which can be used as modelling and trigger endpoints). The degradation of prothioconazole in sterile aqueous buffer under laboratory light conditions was investigated in one study (KCA 7.2.1.2 /02).
The present report comprises the evaluation of the data according to the most recent FOCUS Kinetics report (FOCUS, 2014). Degradation parameters were fitted with the software KinGUI 2.1.
The DT_{50} values derived by the evaluation of the laboratory trial for prothioconazole and its metabolites are shown in Table 7.2.1.2- 1.
One of the purposes of this study was to investigate if there are any degradation products that only form under irradiated conditions. The metabolite JAU 6476-thiazocine *(M12)* is only formed by light in water. No other products only formed by light are found. The metabolites JAU 6476-desthio *(M04)* and 1,2,4-triazole *(M13)* are found in relevant amounts in this study but also in other types of degradation studies. Recoveries of prothioconazole in the dark control samples demonstrated that photolysis is the dominant process of degradation of prothioconazole. Therefore, it is concluded from this study that the solar radiation will also contribute to the degradation of prothioconazole under environmental conditions.
The DT_{50} values were evaluated according to the decision trees of FOCUS to derive trigger and modelling endpoints, but finally, the same kinetic model type was chosen from both decision trees. Therefore, the evaluation is not further split up into trigger and modelling endpoints (Table 7.2.1.2- 1).

Table 7.2.1.2- 1: Endpoints of prothioconazole and its metabolites

Label	Kinetic type[a)]	Endpoints Chi^2	DT$_{50}$ (24 h)[b)] [days]	DT$_{50}$ (environmental days)[c)] [days]	Formation fraction from prothioconazole
Prothioconazole					
phenyl	SFO	3.01	2.01	11.2	-
triazole	SFO	2.35	2.29	12.8	-
geometric mean				*12.0*	
JAU 6476-desthio *(M04)*					
phenyl	SFO	4.38	no reliable fit		
triazole	SFO	10.98	38.3	214	0.667
JAU 6476-thiazocine *(M12)*					
phenyl	SFO	14.1	14.9	83.4	0.187
triazole	SFO	4.89	31.9	178.7	0.126
geometric mean				*122.1*	*0.153*
1,2,4-triazole *(M13)*					
triazole	SFO	-	maximum not reached within the experimental period		from JAU 6476-desthio: 1

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) DT$_{50}$ in experimental days (i.e. 24 h of irradiation per day
c) DT$_{50}$ in environmental days under summer sunlight conditions at Athens/Greece

I. METHODS

The photolytic degradation of prothioconazole was investigated in sterile aqueous phosphate buffer at pH 7.0 using phenyl and triazole labelled active ingredient at a concentration of approx. 4 mg/L (Baseline Dossier, KCA 7.2.1.2 /02). The solutions were continuously exposed to simulated sunlight at 25°C.

The kinetic analysis was performed according to FOCUS kinetics (2014) using the software KinGUI 2.1. Four kinetic models, Single First-Order (SFO) and the bi-exponential models FOMC (First-Order Multi-Compartment model), DFOP (double first order parallel) and HS (Hockey-stick) are assumed to adequately describe the degradation of the applied substance in laboratory trials (FOCUS, 2014).

Calculation of DT$_{50}$ / DT$_{90}$ values: A half-life is defined as the time taken for 50% of substance to disappear/dissipate from a compartment following single first-order kinetics, whereas DT$_{50}$ and DT$_{90}$ values are not strictly connected to a first order kinetics. In this report half-lives, DT$_{50}$ and DT$_{90}$ values are calculated from the appropriate rate constant k as DT$_{50}$ = ln(2)/k and DT$_{90}$ = ln(10)/k, respectively.

Calculation of "environmental day" DT$_{50}$ values: The samples were irradiated continuously for 24 hours/day. The DT$_{50}$ values derived in KinGUI are expressed in experimental days. In nature, the irradiation would be approximately 12 hours, so one way to express more realistic DT$_{50}$ values is to multiply the DT$_{50}$ values derived by KinGUI by 2.

II. RESULTS AND DISCUSSION

Trigger endpoints and modelling endpoints for prothioconazole and its metabolites were derived following the procedure described in FOCUS (2014).

The trigger endpoints and statistical parameters for prothioconazole and its metabolites are given in Table 7.2.1.2- 2 and Table 7.2.1.2- 3, the modelling endpoints and statistical parameters in Table 7.2.1.2- 4 and Table 7.2.1.2- 5.

Table 7.2.1.2- 2: Trigger endpoints and statistical parameters of prothioconazole and its metabolites Phenyl-label

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
Prothioconazole *fit alone*						
SFO	M_0: 98.9 k: 0.380	3.34	k: <0.001	++	1.83	6.06
FOMC	M_0: 98.9 α: 4503 β: 11850	2.58	---	++	1.83	6.06
pathway fit						
SFO	M_0: 98.2 k: 0.345	3.01	k: <0.001	++	**2.01**	6.68
► SFO fit (prothioconazole alone) is visually and statistically acceptable and better than FOMC. The fit of prothioconazole together with the metabolites is acceptable, too, therefore, SFO from pathway fit is used ► **Conclusion**: SFO pathway fit is used						
JAU 6476-desthio *(M04)* *fit all together*						
SFO	k: <0.001	4.38	k: 0.5	++	"Inf"	"Inf"
► The t-test for JAU 6476-desthio fails, the maximum was reached on the last day of the experimental period ► **Conclusion**: no reliable DT50 can be derived						
JAU 6476-thiazocine *(M12)* *fit all together*						
SFO	k: 0.047	14.10	k: 0.008	++	**14.9**	49.5
► SFO fit is visually and statistically good ► **Conclusion**: use SFO						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

Table 7.2.1.2- 3: Trigger endpoints and statistical parameters of prothioconazole and its metabolites Triazole-label

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
Prothioconazole *fit alone*						
SFO	M_0: 97.7 k: 0.326	1.87	k: <0.001	+	2.13	7.07
FOMC	M_0: 97.7 α: 6307 β: 19360	2.06	---	+	2.13	7.07
pathway fit						
SFO	M_0: 97.1 k: 0.303	2.38	k: <0.001	+	**2.29**	7.60
► SFO fit (prothioconazole alone) is visually and statistically acceptable and better than FOMC. The fit of prothioconazole together with the metabolites is acceptable, too, therefore, SFO from pathway fit is used ► **Conclusion**: SFO pathway fit is used						
JAU 6476-desthio *(M04)* *fit all together*						
SFO	k: 0.018	10.98	k: <0.001	+	**38.3**	127
► SFO fit is visually and statistically acceptable ► **Conclusion**: use DT_{50}						
JAU 6476-thiazocine *(M12)* *fit all together*						
SFO	k: 0.022	4.89	k: <0.001	++	**31.9**	106
► SFO fit is visually and statistically good ► **Conclusion**: only little degradation but very good fit, use DT_{50}						
1,2,4-triazole *(M13)* *fit all together*						
SFO	k: 0.031	---	k: <0.001	-	22.7	75.4
► SFO fit is visually acceptable, no X^2 provided ► **Conclusion**: no degradation, do not use DT_{50}						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

Table 7.2.1.2- 4: Modelling endpoints and statistical parameters of prothioconazole and its metabolites phenyl-label

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
Prothioconazole *fit alone*						
SFO	M_0: 98.9 k: 0.380	2.34	k: <0.001	++	1.83	6.06
pathway fit						
SFO	M_0: 98.2 k: 0.345	3.01	k: <0.001	++	**2.01**	6.68
► SFO fit (prothioconazole alone) is visually and statistically acceptable. The fit of prothioconazole together with the metabolites is acceptable, too, therefore, SFO from pathway fit is used ► **Conclusion**: SFO pathway fit is used						
JAU 6476-desthio ***(M04)*** *fit all together*						
SFO	k: <0.001 ff_{PTZ}: 0.550	4.38	k: 0.5	++	"Inf"	"Inf"
► The t-test for JAU 6476-desthio fails: the DT_{50} is therefore not reliable ► **Conclusion**: no reliable DT_{50} or formation fraction can be obtained						
JAU 6476-thiazocine ***(M12)*** *fit all together*						
SFO	k: 0.047 **ff_{PTZ}: 0.187**	14.10	k: 0.008	++	**14.9**	49.5
► SFO fit is visually and statistically good ► **Conclusion**: use SFO						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

Table 7.2.1.2- 5: Modelling endpoints and statistical parameters of prothioconazole and its metabolites triazole-label

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit [b)]	DT_{50} [days]	DT_{90} [days]
Prothioconazole *fit alone*						
SFO	M_0: 97.7 k: 0.326	1.87	k: <0.001	+	2.13	7.07
pathway fit						
SFO	M_0: 97.1 k: 0.303	2.35	k: <0.001	+	**2.29**	7.60
► SFO fit (prothioconazole alone) is visually and statistically acceptable. The fit of prothioconazole together with the metabolites is acceptable, too, therefore, SFO from pathway fit is used ► **Conclusion**: SFO pathway fit is used						
JAU 6476-desthio *(M04)* *fit all together*						
SFO	k: 0.018 **ff_{PTZ}: 0.667**	10.98	k: <0.001	+	**38.3**	127
► SFO fit is visually and statistically acceptable, but JAU 6476-desthio does not show degradation with time, formation fraction is reliable and can be used ► **Conclusion**: only little degradation, do not use DT_{50}						
JAU 6476-thiazocine *(M12)* *fit all together*						
SFO	k: 0.022 **ff_{PTZ}: 0.126**	4.89	k: <0.001	++	**31.9**	106
► SFO fit is visually and statistically good, but JAU 6476-thiazocine does not show degradation with time, formation fraction is reliable and can be used ► **Conclusion**: only little degradation, do not use DT_{50}						
1,2,4-triazole *(M13)* *fit all together*						
SFO	k: 0.031 **$ff_{Desthio}$: 1.0**	--	k: <0.001	-	22.7	75.4
► SFO fit is visually and statistically acceptable, **no degradation,** formation fraction is reliable and can be used ► **Conclusion**: no degradation, do not use DT_{50}						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

CA 7.2.1.3 Indirect photochemical degradation

No study for the determination of the photolytic route and rate of degradation of prothioconazole in natural water has been performed and is not required under Commission Regulation (EU) No 283/2013 in accordance with Regulation (EC) No 1107/2009.

CA 7.2.2 Route and rate of biological degradation in aquatic systems

CA 7.2.2.1 "Ready biodegradability"

A study on the "Ready Biodegradability" of prothioconazole was not performed. However, a water-sediment study under aerobic conditions was performed which is described in KCA 7.2.2.3 /01 (section CA 7.2.2.3).

CA 7.2.2.2 Aerobic mineralisation in surface water

A study for the determination of the route and rate of degradation of prothioconazole in surface water under aerobic conditions in the dark in the laboratory has been performed and is submitted within this Supplemental Dossier for the prothioconazole renewal of approval using the triazole-label position ([redacted] and [redacted], 2014, KCA 7.2.2.2 /01).
In addition a kinetic evaluation of this study was performed to derive kinetic parameters according to FOCUS Guidance 2014 for prothioconazole and its main degradation product JAU 6476-desthio *(M04)*, submitted within this Supplemental Dossier for the prothioconazole renewal of approval ([redacted] and [redacted], 2015, KCA 7.2.2.2 /02).

New study submitted for Annex I Renewal
Justification for including this study in the Annex I Renewal Dossier: This study was conducted to determine the route and rate of degradation of prothioconazole in in surface water under aerobic conditions.

Report:	**KCA 7.2.2.2 /01; [redacted], O.; [redacted], T.; 2014**
Title:	[Triazole-UL-^{14}C]Prothioconazole: Aerobic mineralisation in surface water
Report No:	EnSa-13-0676
Document No:	M-496435-01-1
Guidelines:	OECD Test Guideline No. 309
GLP:	Yes
Justification:	New data / guideline requirement: Route and rate of degradation of prothioconazole in aerobic surface water

Executive Summary
The route and rate of degradation of triazole-labelled prothioconazole were studied in surface water under aerobic conditions in the dark in the laboratory for 60 days at 19.3°C.

Nominal study application rates of 10 µg/L and 100 µg/L surface water were applied for low and high concentration samples, respectively.

Mean material balances were 100.1% AR for the low concentration (range from 96.0 to 104.3% AR) and 101.0% AR for the high concentration (range from 96.8 to 105.2% AR).

Formation of carbon dioxide was insignificant as demonstrated by values ≤ 0.5% AR at all sampling intervals and for both concentrations. The amount of volatile organic compounds was < LOD for both concentrations at all sampling intervals.

The amount of prothioconazole in the surface water decreased from DAT-0 to DAT-60 from 100.2 to 54.1% AR in low concentration test systems and from 103.2 to 73.8% AR in high concentration test systems.

Degradation of prothioconazole was accompanied by the formation of JAU 6476-desthio *(M04)* with a maximum occurrence of 41.9% AR at DAT-42 and DAT-60 in low concentration samples and 29.0% AR at DAT-32 in high concentration samples. The total unidentified residues amounted to a maximum of 2.4% AR and no single component exceeded 1.4% AR at any sampling interval for both concentrations.

The experimental DT_{50} and DT_{90} values were calculated using a double first order in parallel (DFOP) kinetic model. The half-lives for prothioconazole were extrapolated to be about 89.2 and > 1000 days for the low and high concentration, respectively.

It is concluded that moderate degradation (low concentration) to no significant (high concentration) degradation of prothioconazole will occur under typical conditions in surface water.

I. MATERIALS AND METHODS

A. MATERIALS

1. Test Item

triazole-labelled prothioconazole

Sample ID:	KML 9583
Specific Activity:	2.28 MBq/mg (61.64 µCi/mg)
Radiochemical Purity:	> 99%
Chemical Purity:	99%

2. Test Water

Natural water from a fresh water dam that is used for the preparation of drinking water was used (see Table 7.2.2.2- 1). The water was sampled freshly from the pond (depth of approx. 10 cm) and filtered through a 0.063 mm mesh prior to use.

Table 7.2.2.2- 1: Physico-chemical properties of test water

Parameter	Results / Units
Water designation	[redacted]
Origin	[redacted], North Rhine-Westphalia, Germany
GPS coordinates	N 50° 56.8' E 007° 400'
pH[a)]	5.9
Redox potential E_{obs} [mV] [a)]	255.3
Oxygen saturation [%][a)]	83.3
Total organic carbon (TOC) [mg/L][b)]	< 2.0
Dissolved organic carbon (DOC) [mg/L][b)]	< 2.0
Biochemical oxygen demand (DOD_5) [mg/L][b)]	n/a[c)]
Total nitrogen [mg/L][b)]	2.5
Total phosphorous [mg/L][b)]	< 0.03

a) determined on-site at day of sampling
b) measured at start of equilibrium
c) not applicable due to low amount of DOC

B. STUDY DESIGN

1. Experimental conditions

The test was performed in static systems consisting of Erlenmeyer flasks with baffles each containing 100 mL of surface water and equipped with traps (permeable for oxygen) for the collection of carbon dioxide and volatile organic compounds.

For preparation of the test systems, 100 mL of the test water were filled into each flask. The flasks were then fitted with trap attachments and equilibrated to study conditions for 3 days prior to application.

Study application rates of 10 µg/L and 100 µg/L surface water were applied for low and high concentration samples, respectively. The test item was applied onto the water surface of the test systems using a pipette. After application, the test vessels (except DAT-0 samples) were fitted with trap attachments and placed into a temperature-controlled cabinet for incubation at a rotation rate of 120 rpm.
The test system were incubated in the dark for 60 days in a temperature-controlled climatic cabinet at 19.3°C.

2. Sampling

Ten sampling intervals were distributed over the entire incubation period of 60 days. Duplicate samples were processed and analysed 0, 1, 3, 7, 14, 21, 32, 42, 50 and 60 days after treatment (DAT) for both low and high concentration.
Control samples were processed in duplicate 0 and 2 days after treatment.
Solvent control samples were processed together with control samples of DAT-2.
Sterile control samples were processed at study end (DAT-60).

3. Analytical Procedures

At each sampling interval pH, oxygen content and redox potential were determined.
The water was removed from the test systems with an additional rinse of 20 mL ACN. The amounts of prothioconazole and its degradation products in water were determined by liquid scintillation counting (LSC) and by HPLC/radiodetection analysis. The amount of volatiles was determined by LSC. Test item and degradation product were identified by HPLC-MS(/MS) including accurate mass determination.

The degradation kinetics of the test item was determined according to FOCUS kinetics (2006)[1] using the software KinGUI 2. Model input datasets were the residual amounts found in each replicate test system at each sampling interval. The initial recovery at DAT-0 was included in the parameter optimization procedure, but for optimal goodness of fit, the value was allowed to be estimated by the model. DT_{50} and DT_{90} values were calculated from the resulting kinetic parameters.

II. RESULTS AND DISCUSSION

The pH in water ranged from 7.8 to 10.0 (mean: 9.3) in test systems with low concentration and from 7.7 to 10.0 (mean: 9.3) in test systems with high concentration.

Oxygen contents (range from 7.4 to 8.5 mg/L) and redox potential measurement (E_h, range from 384 to 416 mV) indicated aerobic conditions in the water for both concentrations.

A. DATA

Table 7.2.2.2- 2: Degradation of prothioconazole in surface water under aerobic conditions (low concentration, mean values and SD expressed as % AR)

Compound	Mean SD	DAT										
		0	1	3	7	14	21	32	42	50	60	60 sterile
Prothioconazole	Mean	100.2	94.7	92.5	74.7	63.9	74.8	60.9	60.0	65.0	54.1	82.8
	SD	± 0.9	± 2.2	± 1.3	± 6.9	± 3.7	± 5.3	± 1.2	± 2.8	± 7.5	± 1.8	± 0.5
JAU 6476-desthio *(M04)*	Mean	2.6	3.7	4.8	23.9	33.3	25.1	40.6	41.9	37.2	41.9	14.9
	SD	± 0.4	± 0.7	± 1.0	± 5.7	± 4.3	± 4.2	± 3.1	± 0.7	± 5.7	± 0.5	± 1.8
Sum of unid./diff. residues[a)]	Mean	n.d.	n.d.	n.d.	n.d.	1.3	n.d.	n.d.	2.4	1.3	n.d.	n.d.
	SD					± 0.0			± 0.2	± 0.0		
Total extractable residues[b)]	Mean	102.7	98.4	97.3	98.5	98.5	99.9	101.6	104.3	103.6	96.0	97.6
	SD	± 1.3	± 2.9	± 2.3	± 1.2	± 1.9	± 1.0	± 1.8	± 2.3	± 3.1	± 2.3	± 2.3
Carbon dioxide[c)]	Mean	n.a.	<LOD	<LOD	0.3	0.1	0.1	<LOD	<LOD	0.1	<LOD	<LOD
	SD				± 0.3	± 0.1	± 0.1			± 0.1		
Volatile organic compounds [c)]	Mean	n.a.	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
	SD											
Total recovery[b)]	Mean	102.7	98.4	97.3	98.8	98.6	100.0	101.6	104.3	103.6	100.0	97.7
	SD	± 1.3	± 2.9	± 2.3	± 1.5	± 2.0	± 1.0	± 1.8	± 2.3	± 3.1	± 6.3	± 2.3

n.d.: not detected, n.a.: not analysed, DAT: days after treatment, SD: standard deviation
a) minor degradation products are summed up to sum of unidentified / diffuse residues
b) difference to material balance values due to rounding errors as well as clean up and chromatographic losses
c) values taken from material balance

[1] FOCUS (2006): "Guidance Document on Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration" Report of the FOCUS Work Group on Degradation Kinetics, EC Document Reference Sanco/10058/2005 version 2.0, 434 pp

Table 7.2.2.2- 3: Degradation of prothioconazole in surface water under aerobic conditions (high concentration, mean values and SD expressed as % AR)

Compound	Mean SD	DAT 0	1	3	7	14	21	32	42	50	60	60 sterile
Prothioconazole	Mean	103.2	96.0	101.2	87.9	75.2	78.9	73.6	78.2	72.8	73.8	81.5
	SD	± 0.2	± 0.9	± 0.8	± 6.7	± 0.2	± 1.2	± 3.3	± 2.6	± 4.7	± 1.9	± 5.7
JAU 6476-desthio *(M04)*	Mean	n.d.	2.0	3.8	11.3	22.0	22.4	29.0	26.7	24.0	25.5	20.0
	SD		± 0.3	± 0.5	± 2.1	± 3.3	± 1.1	± 3.4	± 4.3	± 2.8	± 1.6	± 4.0
Sum of unid./diff. residues[a)]	Mean	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1.4	n.d.
	SD										± 0.0	
Total extractable residues[b)]	Mean	103.2	98.0	105.0	99.2	97.2	101.4	102.5	104.9	96.8	100.7	101.5
	SD	± 0.2	± 0.6	± 1.4	± 4.6	± 3.1	± 2.3	± 0.1	± 1.7	± 2.0	± 1.7	± 1.7
Carbon dioxide[c)]	Mean	n.a.	0.5	0.2	<LOD	<LOD	<LOD	0.2	<LOD	<LOD	<LOD	<LOD
	SD		± 0.5	± 0.2				± 0.0				
Volatile organic compounds [c)]	Mean	n.a.	<LOD	<LOD	0.2	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
	SD				± 0.0							
Total recovery[b)]	Mean	103.2	98.5	105.2	99.4	97.2	101.4	102.7	104.9	96.8	100.7	101.5
	SD	± 0.2	± 0.1	± 1.5	± 4.8	± 3.1	± 2.3	± 0.1	± 1.7	± 2.0	± 1.7	± 1.7

n.d.: not detected, n.a.: not analysed, DAT: days after treatment, SD: standard deviation
a) minor degradation products are summed up to sum of unidentified / diffuse residues
b) difference to material malance values due to rounding errors as well as clean up and chromatographic losses
c) values taken from material balance

B. MATERIAL BALANCE

Mean material balances were 100.1% AR for the low concentration (range from 96.0 to 104.3% AR) and 101.0% AR for the high concentration (range from 96.8 to 105.2% AR).
The mean material balances for sterile samples were 97.7% AR for the low concentration and 101.5% AR for the high concentration.
The complete material balances found at all sampling intervals for both concentrations demonstrated that there was no significant loss of radioactivity from the test systems or during sample processing.

C. VOLATILES

Formation of carbon dioxide was insignificant as demonstrated by values ≤ 0.5% AR at all sampling intervals and for both concentrations. The amount of volatile organic compounds was < LOD for both concentrations ($LOD_{low\ concentration}$: 2.2% AR, $LOD_{high\ concentration}$: 0.2% AR) at all sampling intervals.

E. DEGRADATION OF PARENT COMPOUND

Degradation of prothioconazole was accompanied by the formation of JAU 6476-desthio *(M04)* with a maximum occurrence of 41.9% AR at DAT-42 and DAT-60 in low concentration samples and 29.0% AR at DAT-32 in high concentration samples. The total unidentified residues amounted to a maximum of 2.4% AR and no single component exceeded 1.4% AR at any sampling interval for both concentrations.
The degradation of prothioconazole followed double first order in parallel (DFOP) kinetics in water with low and high test item concentration according to the lowest chi^2 error values and visual assessments. The table below summarizes the best fit results of the DT_{50} and DT_{90} calculations: (see Table 7.2.2.2-4).

Table 7.2.2.2- 4: Degradation kinetics of prothioconazole in surface water under aerobic conditions according to FOCUS

Concentration	Best fit kinetic model[a)]	DT_{50} [days]	DT_{90} [days]	Chi^2 Error [%]	Visual assessment[b)]
Low	DFOP	89.2	518	5.2	o
High	DFOP	> 1000	> 1000	3.4	o

a) DFOP = double first order in parallel
b) visual assessment: o = moderate

III. CONCLUSIONS

Prothioconazole was moderately degraded at low concentration level and did not show significant degradation at high concentration level in surface water under aerobic conditions in the dark in the laboratory. The calculated best fit half-lives were 89.2 and > 1000 days for low and high concentrations, respectively.
Formation of carbon dioxide was insignificant during the entire incubation period (up to 0.5% AR at DAT-1).
One degradation product, JAU 6476-desthio *(M04)*, was identified with the maximum amounts of 41.9 and 29% AR in samples with low and high concentration, respectively.

The results are included in the proposed degradation pathway of prothioconazole in water shown in Figure 7.2-1 and in the summary of the route and rate of degradation of prothioconazole in water and sediment given in section CA 7.2.

New study submitted for Annex I Renewal
Justification for including this study in the Annex I Renewal Dossier: The kinetic evaluation of the study on the aerobic mineralisation of prothioconazole in surface water ([redacted] and [redacted], 2014, KCA 7.2.2.2 /01) was performed to derive kinetic parameters according to FOCUS Guidance 2014 for prothioconazole and its main degradation product JAU 6476-desthio *(M04)*.

Report:	**KCA 7.2.2.2 /02; [redacted], A.C.; [redacted], C.; 2015**
Title:	Prothioconazole (PTZ) Kinetics aerobic mineralisation - Kinetic evaluation of the aerobic mineralisation of prothioconazole and its metabolite desthio in surface water
Report No:	EnSa-15-0389
Document No:	M-531380-01-1
Guidelines:	FOCUS, 2014: Generic Guidance for Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration, Version 1.1; Date: 18 December 2014
GLP:	No (calculation)
Justification:	Kinetic evaluation of prothioconazole and its major degradation product JAU 6476-desthio *(M04)*

Executive Summary
The purpose of this study was to estimate degradation times (DT_{50}) of the study on the aerobic mineralisation of prothioconazole in surface water according to FOCUS Guidance 2014 for prothioconazole and its main degradation product JAU 6476-desthio *(M04)*. The time course

and concentration dependency of the biodegradation of prothioconazole at two concentration levels in a pelagic test system under aerobic conditions in the dark in the laboratory have been assessed by [redacted] and [redacted] (2014) (KCA 7.2.2.2 /01).
The present report comprises the evaluation of the data according to the most recent FOCUS Kinetics report (FOCUS, 2014). Degradation parameters were fitted with the software KinGUI 2.1.
The DT_{50} values derived by the evaluation of the laboratory trials for prothioconazole and its water metabolite are shown in Table 7.2.2.2- 5.

Table 7.2.2.2- 5: Kinetic endpoints of prothioconazole and its metabolite JAU 6476-desthio *(M04)*

Study	Annex Point / Reference No	Concentration level	Kinetic type[a)]	Trigger endpoint DT_{50} [days]	Modelling endpoint
Prothioconazole					
[redacted], O.; [redacted], T. (2014)	KCA 7.2.2.2 /01	low concentration	DFOP	89.2	184.7
		high concentration	-	not reliable	
JAU 6476-desthio *(M04)*					
[redacted], O.; [redacted], T. (2014)	KCA 7.2.2.2 /01	low concentration	-	not reliable	
		high concentration	-	not reliable	

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel

I. METHODS

Soil residue data from the study on the aerobic mineralisation of prothioconazole in surface water (pelagic test system ([redacted] and [redacted], 2014, KCA 7.2.2.2 /01) were used. In this study, the route and rate of degradation of triazole-labelled prothioconazole were studied in surface water under aerobic conditions in the dark in the laboratory for 60 days at 19.3°C. The nominal study application rates of 10 µg/L and 100 µg/L surface water were applied for low and high concentration samples, respectively.
The kinetic analysis was performed according to FOCUS kinetics (2014) using the software KinGUI 2 with four different kinetic models: Single First-Order (SFO) and the bi-exponential models FOMC (First-Order Multi-Compartment model), DFOP (double first order parallel) and HS (Hockey-stick).
Calculation of DT_{50} / DT_{90} values: A half-life is defined as the time taken for 50% of substance to disappear/dissipate from a compartment following single first-order kinetics, whereas DT_{50} and DT_{90} values are not strictly connected to a first order kinetics. In this report half-lives, DT_{50} and DT_{90} values are calculated from the appropriate rate constant k as $DT_{50} = \ln(2)/k$ and $DT_{90} = \ln(10)/k$, respectively.

II. RESULTS AND DISCUSSION

DT_{50} values for prothioconazole and its metabolite JAU 6476-desthio *(M04)* were derived following the procedure described in FOCUS (2014).
The kinetic endpoints and statistical parameters for prothioconazole and JAU 6476-desthio *(M04)* for both concentrations are given in Table 7.2.2.2- 6 and Table 7.2.2.2- 7, respectively. A summary of the best fits of the trigger endpoints of prothioconazole is given in Table 7.2.2.2- 5 in the Executive Summary of this report.

Table 7.2.2.2- 6: Kinetic endpoints and statistical parameters of prothioconazole
(Prothioconazole fit alone)
best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit[b)]	DT_{50} [days]	DT_{90} [days]
[redacted] and [redacted], 2014 (KCA 7.2.2.2 /01)						
low concentration						
SFO	M_0: 91.0 k: 0.010	8.71	k: <0.001	-	71.4	237.1
FOMC	M_0: 103.2 α: 0.159 β: 1.542	5.23	-	+	118.7	>1000
DFOP	M_0: 102.9 k_1: 0.212 k_2: 0.004 g: 0.301	5.15	k_1: 0.042 k_2: 0.067 g: <0.001	+	**89.2** **184.7** **(model)**	518.1
HS	M_0: 101.8 k_1: 0.043 k_2: 0.004 tb: 8.679	4.74	k_1: <0.001 k_2: 0.022 tb: 0.001	-	89.7	491.9

► SFO not more appropriate than FOMC, constraining M_0 will not improve the course of the curve. 10% of the initially measured concentration were not reached within the experimental period therefore FOMC is rejected. DFOP and HS have been fitted, DFOP provides best fit, although, the t-test of k_2 is slightly above 0.05.
► **Conclusion**: use DT_{50} of DFOP = 89.2 days (trigger endpoint) and the DT_{50} of slow phase (ln(2) / 0.067 = 184.7 as modelling endpoint

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit[b)]	DT_{50} [days]	DT_{90} [days]
high concentration						
SFO	M_0: 95.2 k: 0.006	6.13	k: <0.001	-	121.5	403.7
FOMC	M_0: 103.4 α: 0.105 β: 1.860	3.90	-	+	>1000	>1000
DFOP	M_0: 103.2 k_1: 0.111 k_2: <0.001 g: 0.282	3.43	k_1: 0.050 k_2: 0.500 g: 0.003	+	**>1000**	>1000
HS	M_0: 102.4 k_1: 0.020 k_2: 0.001 tb: 14.00	2.81	k_1: <0.001 k_2: 0.249 tb: 0.002	-	459.2	>1000

► SFO not more appropriate than FOMC, constraining M_0 does not improve the course of the curve. 10% of the initially measured concentration were not reached within the experimental period therefore FOMC is rejected. DFOP and HS have been fitted, DFOP provides best fit, although, the t-test of k_2 is 0.5.
► **Conclusion**: no reliable DT_{50} can be obtained

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

Table 7.2.2.2- 7: Kinetic endpoints and statistical parameters of JAU 6476-desthio *(M04)* (together with prothioconazole) best fits highlighted in **bold letters**

Type of kinetics[a)]	Fitted parameters	X^2 error [%]	p (t-test)	Visual fit[b)]	DT_{50} [days]	DT_{90} [days]
[redacted] and [redacted], 2014 (KCA 7.2.2.2 /01)						
low concentration						
together with prothioconazole (SFO)						
SFO	M_0: 0 k: 0.003 ff_{PTZ}: 1	25.83	k: 0.373	-	211.5	702.7
together with prothioconazole (DFOP)						
SFO	M_0: 0 k: <0.001 ff_{PTZ}: 0.952	12.53	k: 0.5	+	**>1000**	>1000
► JAU 6476-desthio *(M04)* shows no decline, fit with DFOP-prothioconazole provides acceptable fit, although t-test is not passed for the k JAU 6476-desthio ► **Conclusion**: no reliable DT_{50} obtainable						
high concentration						
together with prothioconazole (SFO)						
SFO	M_0: 0 k: 0.030 ff_{PTZ}: 1	10.81	k: <0.001	o	22.82	75.8
together with prothioconazole (DFOP)						
SFO	M_0: 0 k: 0.003 ff_{PTZ}: 1.0	8.08	k: 0.295	+	**258.7**	859.3
► JAU 6476-desthio *(M04)* shows no decline, fit with DFOP-prothioconazole provides acceptable fit, although t-test is not passed for the k JAU 6476-desthio ► **Conclusion**: no reliable DT_{50} can be obtained						

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor

III. CONCLUSIONS

For the low concentration a DT_{50} value of 89.2 days can be used for prothioconazole as trigger endpoint and a DT_{50} of 184.7 days as modelling endpoint. For the high concentration no reliable DT_{50} value can be obtained.
For JAU 6476-desthio *(M04)* no reliable DT_{50} value can be obtained for the low and the high concentration.

CA 7.2.2.3 Water/sediment study

The route and rate of degradation of prothioconazole in water/sediment systems under aerobic and anaerobic conditions were evaluated during the Annex I inclusion using two radiolabel positions, phenyl- and triazole-label, and was accepted by the European Commission (EFSA Scientific Report (2007) 106, 1-98, 12 July 2007). Furthermore, water/sediment study performed under anaerobic

conditions was submitted during the Annex I inclusion using the radiolabel position of the phenyl-label. The following studies are included in the Baseline Dossier:

Compound Annex Point / Reference No.	Author(s)	Year	Document No.
water/sediment, aerobic			
KCA 7.2.2.3 /01	[redacted], B.; [redacted], M.	2001, rev 2002	M-034440-02-1
KCA 7.2.2.3 /02[a)]	[redacted], T.	2001	M-066336-01-1
water/sediment, anaerobic			
KCA 7.2.2.3 /04	[redacted], K.	2001	M-137101-01-1

a) submitted within the 2002-03: III A, 9 /03 (EC 250) dossier, mentioned in the DAR, VOL 3, B.8

For a better understanding the corresponding summaries of these studies as given in the Baseline Dossier are given below (grey coloured). Changes in these evaluations - based on *e.g* change of trigger values in the new regulation EC no. 1107/2009[1] - are distinguished in black to show them as revised information.

No additional studies are submitted within this Supplemental Dossier for the prothioconazole renewal of approval. However, updated kinetic evaluations of the degradation behaviour of prothioconazole in the water or sediment phase as well as in the total system of water-sediment-system under aerobic in the dark have been performed according to FOCUS kinetics (2011). The kinetic evaluation is summarised in KCA 7.2.2.3 /03.

A summary of the route and rate of degradation of prothioconazole in water and sediment is given in section CA 7.2 and Figure 7.2-1.

- **Water/sediment, aerobic**

Report:	**KCA 7.2.2.3 /01; [redacted], B.; [redacted], M.; 2001, amended 2002**
Title:	Aerobic degradation and metabolism of the active ingredient JAU6476 in the water/sediment-system
Report No:	MR-395/01
Document No:	M-034440-02-1
Guidelines:	- BBA Guidelines for Official Testing of Plant Protectants, Part IV, 5 1, Degradation and Fate of Plant Protectants in water/sediment systems, December 1990 - Commission Directive 95/36/EC of 14 July 1995 amending Council Directive 91/414/EEC concerning the placing of plant protection products on the market, Official Journal of the European Communities No. L 172, 22/07/1995 - SETAC-Europe: Procedures for Assessing the Environmental Fate and Ecotoxicity of Pesticides, March 1995
GLP:	Yes

Test system: The degradation and metabolism of JAU 6476 was studied in two different water/sediment systems (loam, [redacted], Germany and loamy sand, [redacted], Germany), for a maximum of 121 days under aerobic conditions in the dark at 20°C. The characteristics of the sediments and supernatant water of both systems are given in Table 7.2.2.3- 1. Either phenyl- or triazole-labelled

[1] Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC Official Journal of the European Union L 309, 24.11.2009

JAU 6476 was applied at a dose of about 67 µg/L water corresponding to an application rate of 200 g a.s./ha (maximum single use rate), based on a water depth of 30 cm. The test system consisted of glass flasks attached with a trap for collection of CO_2 and volatile organic compounds. The test vessels were processed and investigated at 0, 1, 3, 7, 14, 29, 59 and 121 days after treatment.
The water layer was decanted and centrifuged, the sediment layer was extracted with acetonitrile/water (9:1). Quantitative analysis of JAU 6476 and the metabolites was achieved by TLC analysis.

Table 7.2.2.3- 1: Characteristics of the water/sediment systems

Origin	[redacted]		[redacted]	
Sediment layer characteristics:				
Textural class (USDA)	Loam		Loamy sand	
Textural analysis (USDA):				
2000 - 50 µm, sand (%)	33.1		81.7	
50 - 2 µm, silt (%)	48.2		11.6	
< 2 µm, clay (%)	18.0		6.7	
pH value:				
Water	6.8		8.5	
$CaCl_2$	6.8		7.4	
Organic C (%)	4.80		1.37	
Organic matter (%) [factor: 1.724 x organic C (%)]	8.28		2.36	
Cation exchange capacity (meq Ba/100 g)			8.1	
Total nitrogen (% N)	0.36		0.13	
Total phosphorus (mg P/kg)	807		254	
$CaCO_3$ (%)	< 0.1		0.6	
Dry matter content (%)	41.9		74.2	
Particle density (%)	2.52		2.61	
Water layer characteristics:	**Prior start[a)]**	**End of exp.[b)]**	**Prior start[a)]**	**End of exp.[b)]**
Total nitrogen (mg N/L)	9.3	4.2	6.3	9.5
Total phosphorus (mg P/L)	< 0.003	0.48	< 0.03	1.39
Total organic carbon content TOC (mg C/L)	< 2	31	< 2	6
Dissolved organic carbon content DOC (mg C/L)	2		< 2	3
Hardness (grad DH)	3.7	4.0	10.2	12.1
Data measured in the field at March 24, 1998				
Temperature water (°C)	3		8.1	
pH value	7.84		7.45	
Oxygen saturation (%)[c)]	93		112	
Redox potential (mV)				
Water	205		223	
Sediment	96		216	

a) = data from water collected in the field on Febr. 18, 1998
b) = data from water collected from test vessels on day 121 (Aug. 20, 1998)
c) = relative to oxygen saturation at 25°C

Findings:
During the study, the total recovery of radioactivity in individual test vessels of the [redacted] system ranged from 91.8% to 101.5% of the applied radioactivity, and the mean was 98.1%. In the [redacted] system, the total recovery of radioactivity ranged from 93.7% to 104.2% and the mean was 100.6%.
The amount of bound residues increased during the course of the study, especially in the [redacted] loam system with high organic carbon content. There, the portions of bound residues reached a maximum of 50.8% (phenyl-label, day 59 and 121) and 52.5% (triazole-label, day 121) of the applied radioactivity. The corresponding maximum values for the [redacted] system were 31.3% (phenyl-label, day 121) and 20.9% (triazole-label, day 59). The comparison of both systems indicated that a

higher portion of $^{14}CO_2$ was formed from the phenyl-label. At the end of the experiment on day 121, a total of 14.7% (phenyl-label) and 1.9% (triazole–label) was recovered as $^{14}CO_2$ in the [redacted] See system and 29.0% (phenyl-label) and 1.9% (triazole-label) in the [redacted] system. The distribution of the radioactivity in the two water/sediment systems is summarised in Table 7.2.2.3- 2 and Table 7.2.2.3- 3. The calculations summarised in the tables were performed using the computer software Microsoft Excel 97. The results given are values rounded to one decimal place. Rounding errors may occur if recalculations are made using the rounded values.

Table 7.2.2.3- 2: Distribution and total recovery of the radioactivity after application of JAU 6476 in the Hönniger Weiher water/sediment system (in percent of applied radioactivity)

Label	Days after appl.	Water layer[a)]	Sediment			Volatiles				Material balance
			Ex-tracted[b)]	Bound[c)]	Sub-total sedi-ment layer	Gas space	$^{14}CO_2$ Water layer	Sub-total $^{14}CO_2$	Organic volatiles	
Phenyl	0	68.0	13.0	17.7	30.7	n.m.	n.m.	n.m.	n.m.	98.6
	1	31.2	38.1	27.5	65.6	< 0.1	< 0.1	< 0.1	< 0.1	96.7
	3	21.4	43.5	29.5	73.0	0.1	< 0.1	0.1	< 0.1	94.5
	7	10.5	43.3	44.6	87.9	0.3	< 0.1	0.3	< 0.1	98.7
	14	6.6	47.8	45.3	92.7	0.1	< 0.1	0.5	< 0.1	100.1
	29	3.9	45.2	46.3	91.4	0.9	< 0.1	0.9	< 0.1	96.3
	59	3.4	43.2	47.8	94.0	4.1	< 0.1	4.1	< 0.1	101.5
	121	1.5	30.1	50.8	81.1	14.7	< 0.1	14.7	< 0.1	97.3
Triazole	0	67.3	18.6	14.8	33.3	n.m.	n.m.	n.m.	n.m.	100.6
	1	29.7	37.9	29.5	67.4	< 0.1	< 0.1	< 0.1	< 0.1	97.1
	3	19.6	35.2	37.1	72.2	< 0.1	< 0.1	< 0.1	< 0.1	91.8
	7	13.3	43.6	43.1	86.7	< 0.1	< 0.1	< 0.1	< 0.1	100.0
	14	6.1	46.2	48.0	94.2	< 0.1	< 0.1	< 0.1	< 0.1	101.0
	29	3.8	45.6	43.9	89.6	0.1	< 0.1	0.1	< 0.1	95.4
	59	3.8	52.0	45.4	97.4	0.2	< 0.1	0.2	< 0.1	101.4
	121	4.7	39.5	52.5	92.0	1.9	< 0.1	1.9	< 0.1	98.6
				Mean:						*98.1*

n.m. = not measured
a) = values after subtraction of content of carbon dioxide
b) = extracted: organic extracted + hot extraction
c) = not extracted: exhaustive extraction sediment + filter

Table 7.2.2.3- 3: Distribution and total recovery of the radioactivity after application of JAU 6476 in the Angler Weiher water/sediment system (in percent of applied radioactivity)

Label	Days after appl.	Water layer[a)]	Sediment			Volatiles				Material balance
			Ex-tracted[b)]	Bound[c)]	Sub-total sedi-ment layer	$^{14}CO_2$ Gas-space	$^{14}CO_2$ Water layer	Sub-total $^{14}CO_2$	Organic volatiles	
Phenyl	0	79.3	21.4	1.5	22.9	n.m.	n.m.	n.m.	n.m.	102.1
	1	54.8	38.5	7.3	45.8	< 0.1	< 0.1	< 0.1	< 0.1	100.6
	3	50.1	39.9	10.4	50.3	< 0.1	0.1	0.1	< 0.1	100.2
	7	44.0	43.5	13.8	57.3	0.1	0.3	0.4	< 0.1	101.7
	14	38.3	45.5	16.3	61.9	0.6	1.0	1.5	< 0.1	101.7
	29	32.2	43.3	20.0	63.2	4.2	0.2	4.4	< 0.1	99.8
	59	22.7	32.6	27.0	59.7	11.3	1.9	13.2	< 0.1	95.7
	121	13.8	19.6	31.3	50.9	27.5	1.5	29.0	< 0.1	93.7
Triazole	0	82.8	17.2	1.3	18.5	n.m.	n.m.	n.m.	n.m.	101.3
	1	61.5	33.0	6.7	39.7	< 0.1	< 0.1	< 0.1	< 0.1	101.2
	3	52.3	38.9	9.6	48.5	< 0.1	< 0.1	< 0.1	< 0.1	100.8
	7	41.4	47.1	14.5	61.7	< 0.1	0.1	0.1	< 0.1	103.1
	14	43.4	45.8	14.9	60.6	0.1	0.1	0.1	< 0.1	104.2
	29	38.6	45.1	16.4	61.5	0.1	< 0.1	0.1	< 0.1	100.1
	59	46.6	34.2	20.9	55.1	0.3	0.1	0.3	< 0.1	102.0
	121	55.7	24.0	18.9	43.0	1.7	0.2	1.9	< 0.1	100.6
									Mean:	*100.6*

n.m. = not measured
a) = values after subtraction of content of carbon dioxide
b) = extracted: organic extracted + hot extraction
c) = not extracted: exhaustive extraction sediment + filter

Along with the parent compound and $^{14}CO_2$, five metabolites were identified: JAU 6476-S-methyl *(M01)*, JAU 6476-triazolinone *(M03)*, JAU 6476-desthio *(M04)*, 1,2,4 triazole *(M13)* and JAU 6476-triazolylketone *(M42)*.

JAU 6476-desthio *(M04)* was found as a major metabolite in the water layer of both systems, with maximum values of 13.9% ([redacted], phenyl-label, day 0) and 32.3% ([redacted], phenyl-label, day 7) of the applied radioactivity. Additionally 1,2,4-triazole *(M13)* was found as a major metabolite in the water layer of the [redacted] system with a maximum of 37.2% (triazole-label, day 121) of the applied radioactivity . The metabolite JAU 6476-triazolylketone *(M42)* was found above 5% AR at two sequential sampling points (max. 8% ([redacted], triazole label, day 59). The other metabolites (JAU 6476-S-methyl *(M01)* and JAU 6476-triazolinone *(M03)* were found in low amounts in the water layer.

In the sediment layers JAU 6476-desthio *(M04)* occurred as the only major metabolite, with maximum values of 21.9% ([redacted], phenyl-label, day 59) and 26.9% ([redacted], both labels, day 14) of the applied radioactivity. In addition (JAU 6476-S-methyl *(M01)* was found above 5% AR at more two sequential sampling points (max. 69.6% ([redacted], triazole label, day 7). 1,2,4-Triazole *(M13)* and JAU 6476-triazolylketone *(M42)* increased at study end up to 6.1% and 5.8%, respectively ([redacted], triazole-label). JAU 6476-triazolinone *(M03)* was found in low amounts in the sediment.

In the water and sediment extracts additionally several unknown metabolites were also detected. None of them exceeded 8% of the applied radioactivity. The distribution of the active substance and the metabolites in both systems is summarised in the Table 7.2.2.3- 4 and Table 7.2.2.3- 4.

Table 7.2.2.3- 4: Dissipation of JAU 6476 and formation of metabolites in the [redacted] water/sediment system (in percent of applied radioactivity)

Label	Compartment	Days after appl.	a.s.	M01	M03	M04	M13	M42	Unknown/ minor metabolites[a)]
Phenyl	Water layer	0	52.7	n.d.	0.2	13.9			0.6
		1	19.1	0.6	0.7	9.9			0.3
		3	12.7	0.8	1.1	6.1			0.3
		7	4.9	0.4	1.0	3.7			0.1
		14	2.0	0.2	1.0	3.0			0.3
		29	0.8	0.1	1.5	1.3			0.1
		59	0.4	n.d.	0.7	1.1			0.0
		121	n.d.	n.d.	n.d.	n.d.			n.d.
	Sediment layer	0	0.2	n.d.	n.d.	5.5			0.1
		1	23.4	1.8	0.6	11.0			0.6
		3	21.7	3.0	1.1	16.0			0.9
		7	21.0	3.7	2.1	14.7			1.1
		14	23.0	4.0	3.0	15.8			1.0
		29	16.0	4.6	4.6	13.1			1.9
		59	7.5	5.0	4.8	11.9			2.2
		121	4.9	3.1	3.6	11.1			2.1
Triazole	Water layer	0	59.8	n.d.	n.d.	7.3	n.d.	n.d.	n.d.
		1	18.3	0.8	0.8	2.2	n.d.	n.d.	n.d.
		3	12.1	0.7	1.0	4.9	n.d.	n.d.	n.d.
		7	7.1	0.5	1.0	4.3	n.d.	n.d.	n.d.
		14	1.9	0.3	0.8	2.3	n.d.	n.d.	0.4
		29	2.0	0.1	1.2	0.6	n.d.	0.3	0.5
		59	0.1	n.d.	0.6	0.7	0.8	n.d.	1.5
		121	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
	Sediment layer	0	12.6	0.1	n.d.	4.8	0.1	n.d.	0.4
		1	22.4	1.1	0.6	9.5	0.1	n.d.	1.4
		3	24.4	2.7	1.0	14.9	0.2	n.d.	0.6
		7	20.9	4.0	2.1	14.0	0.1	n.d.	1.8
		14	18.4	3.9	3.9	16.8	0.2	0.4	2.8
		29	15.5	4.8	4.3	16.9	0.4	1.3	1.5
		59	14.7	4.1	6.1	17.7	3.9	2.1	1.5
		121	6.8	2.8	3.1	9.5	6.1	5.8	0.9

n.d. =not detected
a) =phenyl-label: sum of all unknown metabolites, none did exceed 1% of the applied radioactivity in the water layer and in the sediment
triazole-label: sum of four unknown metabolites, none did exceed 2% of the applied radioactivity in the water layer and in the sediment

a.s. = JAU 6476
M01 = JAU 6476-S-methyl
M03 = JAU 6476-triazolinone
M04 = JAU 6476-desthio
M13 = 1,2,4-triazole
M42 = JAU 6476-triazolylketone

Table 7.2.2.3- 5: Dissipation of JAU 6476 and formation of metabolites in the [redacted] water/sediment system (in percent of applied radioactivity)

Label	Compartment	Days after appl.	a.s.	M01	M03	M04	M13	M42	Unknown / minor metabolites[a)]
Phenyl	Water layer	0	68.7	n.d.	0.3	9.3			
		1	32.9	1.5	n.d.	18.3			2.0
		3	9.9	2.4	0.3	31.3			6.0
		7	1.7	2.1	0.3	28.3			7.3
		14	0.8	1.4	0.5	26.3			7.2
		29	0.4	0.8	0.3	21.4			9.3
		59	0.2	0.1	1.6	7.1			13.1
		121	0.4	n.d.	1.3	4.2			8.3
	Sediment layer	0	1.0	0.2	n.d.	3.9			0.1
		1	21.0	4.4	n.d.	11.8			0.6
		3	15.3	5	n.d.	16.8			1.4
		7	11.8	6.4	0.2	22.3			3.1
		14	8.0	6.9	n.d.	26.9			2.9
		29	5.8	6.2	0.3	25.9			4.7
		59	5.1	4.1	0.3	9.4			5.5
		121	3.4	2.0	2.3	8.2			2.3
Triazole	Water layer	0	76.3	n.d.	0.3	5.1	n.d.	n.d.	0.8
		1	39.2	1.5	n.d.	16.9	0.5	n.d.	1.3
		3	11.7	2.7	0.3	31.9	1.5	n.d.	4.6
		7	2.7	3.1	0.3	30.6	1.3	0.7	3.7
		14	0.9	1.3	0.3	26.9	3.1	2.4	8.2
		29	0.3	1.1	0.3	17.3	3.5	2.2	10.5
		59	0.4	0.2	2.2	7.6	12.6	8.0	15.4
		121	n.d.	n.d.	1.6	1.1	37.2	5.6	8.6
	Sediment layer	0	13.6	0.1	n.d.	3.1	0.1	n.d.	0.2
		1	18.3	1.1	n.d.	9.8	0.2	n.d.	0.3
		3	14.7	3.3	n.d.	16.8	0.4	n.d.	1.1
		7	10.4	9.6	0.4	24.2	0.1	n.d.	1.7
		14	7.7	6.4	1.1	26.9	0.6	0.3	3.0
		29	6.2	7.8	1.5	24.5	0.4	0.4	2.9
		59	2.4	3.6	n.d.	14.0	1.9	1.1	6.2
		121	3.3	1.9	n.d.	7.1	4.6	0.3	3.5

n.d. =not detected
a) =phenyl-label: sum of seven unknown metabolites none did exceed 5.5% of the applied radioactivity in the water layer and 2% in the sediment
triazole-label: sum of six unknown metabolites, none did exceed 8% of the applied radioactivity in the water layer and 3% in the sediment

a.s. = JAU 6476
M01 = JAU 6476-S-methyl
M03 = JAU 6476-triazolinone
M04 = JAU 6476-desthio
M13 = 1,2,4-triazole
M42 = JAU 6476-triazolylketone

As a new kinetic evaluation of this study was performed the DT_{50} and DT_{90} values calculated originally in this study are not repeated here.

New kinetic evaluation submitted for Annex I Renewal

Justification for including this study in the Annex I Renewal Dossier: The objective of this study was to estimate degradation and dissipation times (DT_{50}) of prothioconazole and its major aquatic metabolites in the water – sediment systems for use in model simulations of environmental exposures and as trigger endpoints using data of a water-sediment study performed under aerobic conditions (KCA 7.2.2.3 /01, submitted within the Baseline Dossier) and following the FOCUS kinetics document (2011).

Report:	**KCA 7.2.2.3 /03; [redacted], A. and [redacted] C.; 2015**
Title:	Prothioconazole (PTZ) and metabolites: Kinetic evaluation of the soil degradation of the aerobic aquatic metabolism of prothioconazole in two laboratory water/sediment systems
Report No:	EnSa-14-1115
Document No:	M-534364-01-1
Guidelines:	FOCUS, 2011: Generic guidance for Estimating Persistence and Degradation Kinetics from Environmental Fate Studies on Pesticides in EU Registration, Version 1, 23rd of November, 2011
GLP:	No (calculation)
Justification:	New data / guideline requirement: degradation and dissipation times (DT_{50}) of prothioconazole and its major aquatic metabolites in the water-sediment systems for use in model simulations of environmental exposures and as trigger endpoints

Executive Summary

The purpose of this study was to estimate degradation and dissipation times (DT_{50}) of the active substance prothioconazole and its major aquatic metabolites in the water – sediment systems for use in model simulations of environmental exposures and as trigger endpoints.

The behaviour of prothioconazole in the aquatic environment under aerobic was investigated by kinetic evaluation of two aerobic water/sediment studies conducted with two test systems, Hönniger Weiher and Anglerweiher, using radio-labelled prothioconazole. The parent and its major aquatic metabolites, JAU 6476-S-methyl *(M01)*, JAU 6476-desthio *(M04)*, 1,2,4-triazole *(M13)* and JAU 6476-triazolylketone *(M42)* were assessed.

Dissipation half-lives in the water phase and in the sediment phase for prothioconazole and its metabolites as well as degradation half-lives in the total system for parent and metabolites were derived, using the data from the water-sediment degradation study of [redacted] and [redacted] (2001, rev. 2002) (KCA 7.2.2.3 /01, included in the Baseline Dossier). Formation fractions for the metabolites were also derived. The kinetic evaluation was performed according to the guidance given by the FOCUS Kinetics report (FOCUS, 2011); degradation parameters were fitted with the software KinGUI 2.1.

The half-lives of prothioconazole for <u>trigger</u> evaluation were between 0.9 and 1.45 days in the total system, between 0.3 and 0.7 days in the water and between 7.4 and 76.2 days in the sediment. The half-lives of JAU 6476-S-methyl *(M01)* were between 39.5 and 180 days in the total system, between 4.0 and 11.9 days in the water and between 48.4 and 59.3 days in the sediment. The half-lives of JAU 6476-desthio *(M04)* were between 39.1 and 75.8 days in the total system, between 2.4 and 30.6 days in the water and between 52.3 and 62.0 days in the sediment. For the metabolites 1,2,4-triazole *(M13)* and JAU 6476-triazolylketone *(M42)* the evaluation for the half-lives for trigger evaluation was not possible. An overview is given in Table 7.2.2.3- 6.

The half-lives of prothioconazole for <u>modelling</u> evaluation were between 3.4 and 83.1 days in the total system, between 0.9 and 1.7 days in the water and between 60.2 and 106 days in the sediment. The half-lives of JAU 6476-S-methyl *(M01)* were between 39.5 and 180 days in the total system, between 9.2 and 11.9 days in the water (and between 48.4 and 59.3 days in the sediment. The half-lives of JAU 6476-

desthio *(M04)* were and between 39.1 and 75.8 days in the total system, between 13.5 and 30.6 days in the water and between 52.3 and 62.0 days in the sediment. For the metabolites 1,2,4-triazole *(M13)* and JAU 6476-triazolylketone *(M42)* the evaluation for the half-lives for modelling evaluation was not possible. An overview is given in Table 7.2.2.3- 7.

The estimated formation fraction are summarised in Table 7.2.2.3- 8.

Table 7.2.2.3- 6: Overview of estimated modelling half-lives (dissipation or degradation DT_{50}) for prothioconazole and its major aquatic metabolites in the total system, water and sediment phase as trigger endpoints

System/label	Prothioconazole		JAU 6476-S-methyl *(M01)*		JAU 6476-desthio *(M04)*		1,2,4-Triazole *(M13)*
	DT_{50} [days]	Kinetic type[a)]	DT_{50} [days]	Kinetic type[a)]	DT_{50} [days]	Kinetic type[a)]	
Total system (degradation)							
[redacted], phenyl-label	1.45	FOMC	180	SFO[c)]	---	---	b)
[redacted], triazole-label	0.91	DFOP	134	SFO[c)]	75.8	SFO[c)]	b)
Geometric mean	*1.15*		*155*		*75.8*		
[redacted], phenyl-label	1.20	DFOP	44.8	SFO[c)]	42.6	SFO[c)]	b)
[redacted], triazole-label	1.33	DFOP	39.5	SFO[c)]	39.1	SFO[c)]	b)
Geometric mean	*1.26*		*42.0*		*40.8*		
Overall geometric mean	**1.20**		**80.7**		**55.6**		
Water (dissipation)							
[redacted], phenyl-label	0.48	HS	3.99	DFOP	2.38	FOMC	b)
[redacted]triazole-label	0.27	DFOP	9.17	SFO	3.91	DFOP	b)
Geometric mean	*0.36*		*6.05*		*3.05*		
[redacted], phenyl-label	0.56	FOMC	11.6	SFO	27.7	SFO	b)
[redacted]-triazole-label	0.71	FOMC	11.9	SFO	30.6	SFO	b)
Geometric mean	*0.63*		*11.7*		*29.1*		
Overall geometric mean	**0.48**		**8.43**		**9.42**		
Sediment (dissipation)							
[redacted], phenyl-label	60.2	SFO	no evaluation possible				b)
[redacted], triazole-label	76.2	SFO	no evaluation possible				b)
Geometric mean	*67.7*		---		---		
[redacted], phenyl-label	7.36	FOMC	59.3	SFO	62.0	SFO	b)
[redacted], triazole-label	8.36	DFOP	48.4	SFO	52.3	SFO	b)
Geometric mean	*7.84*		53.6		57.0		
Overall geometric mean	**23.05**		**53.6**		**57.0**		

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) no evaluation of 1,2,4-trizole possible
c) fit together with parent

Table 7.2.2.3- 7: Overview of estimated modelling half-lives (dissipation or degradation DT_{50}) for prothioconazole and its major aquatic metabolites in the total system, water, and sediment phase as <u>modelling</u> endpoints

System/label	Prothioconazole DT50 [days]	Prothioconazole Kinetic type[a)]	JAU 6476-S-methyl *(M01)* DT50 [days]	JAU 6476-S-methyl *(M01)* Kinetic type[a)]	JAU 6476-desthio *(M04)* DT50 [days]	JAU 6476-desthio *(M04)* Kinetic type[a)]	1,2,4-Triazole *(M13)*
Total system (degradation)							
[redacted], phenyl label	83.1	c)	180	SFO[f)]	---	---	b)
[redacted], triazole label	29.1	d)	134	SFO[f)]	75.8	SFO[f)]	b)
Geometric mean	*49.2*		*155*		*75.8*		
[redacted], phenyl label	4.97	d)	44.8	SFO[f)]	42.6	SFO[f)]	b)
[redacted], triazole label	3.40	d)	39.5	SFO[f)]	39.1	SFO[f)]	b)
Geometric mean	*4.11*		*42.0*		*40.8*		
Overall geometric mean	**14.2**		**80.7**		**55.6**		
Water (dissipation)							
[redacted]phenyl label	1.53	e)	9.23	SFO[d)]	14.0	SFO[c)]	b)
[redacted], triazole label	1.68	d)	9.17	SFO	13.5	SFO[d)]	b)
Geometric mean	*1.60*		*9.20*		*13.7*		
[redacted]phenyl label	0.86	c)	11.6	SFO	27.7	SFO	b)
[redacted], triazole label	0.95	c)	11.9	SFO	30.6	SFO	b)
Geometric mean	*0.90*		*11.7*		*29.1*		
Overall geometric mean	**1.20**		**10.4**		**20.0**		
Sediment (dissipation)							
[redacted], phenyl label	60.2	SFO	No evaluation possible				b)
[redacted], triazole label	76.2	SFO	No evaluation possible				b)
Geometric mean	*67.7*		---		---		
[redacted], phenyl label	106	DFOP[g)]	59.3	SFO	62.0	SFO	b)
[redacted], triazole label	84.7	DFOP[g)]	48.4	SFO	52.3	SFO	b)
Geometric mean	*94.7*		53.6		57.0		
Overall geometric mean	**80.1**		**53.6**		**57.0**		

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) no evaluation of 1,2,4-trizole possible
c) back calculated from FOMC
d) back calculated from DFOP
e) back calculated from HS
f) fit together with parent
g) slow phase

Table 7.2.2.3- 8: Estimated formation fractions of major metabolites of prothioconazole from the total system (mean of both labels)

	Formation fraction (mean of both labels)		
	[redacted]	[redacted]r	Arithmetic mean
Parent to JAU 6476-S-methyl *(M01)*	0.075	0.121	0.098
Parent to JAU 6476-desthio *(M04)*	0.383	0.697	0.540
JAU 6476-desthio *(M04)* to 1,2,4-triazole *(M13)*	0.352	0.529	0.440

I. METHODS

The degradation or dissipation half-lives for the behaviour of prothioconazole and its metabolites in the water or sediment phase as well as in the total system of water-sediment-system in the dark, using data from [redacted] and [redacted] (2001, rev. 2002) (KCA 7.2.2.3 /01, included in the Baseline Dossier) following the FOCUS kinetics document (2011). Formation fractions for the metabolites were also derived.

The FOCUS kinetics report distinguishes between two levels of kinetics: At Level 1, a single compartment is used to derive degradation endpoints from the whole system or dissipation endpoints from each compartment separately, the water column or the sediment. Level 2 is for two-compartmental approaches to estimate the real degradation in the water column and sediment compartment considering the exchange rates between water and sediment.

The parent substance prothioconazole and its major aquatic metabolites - JAU 6476-S-methyl *(M01)*, JAU 6476-desthio *(M04)*, 1,2,4-triazole *(M13)* and JAU 6476-triazolylketone *(M42)* - were addressed for the total system (Level 1) and water and sediment phases (Level 1 and 2).

The kinetic evaluation was performed according to the guidance given by the FOCUS Kinetics report (FOCUS, 2011); degradation parameters were fitted with the software KinGUI 2.1. Four kinetic models, the single first-order (SFO), first-order multiple-compartment (FOMC, Gustafson-Holden), the hockey-stick model (HS or known as DFOS = double first order sequential), and the bi-exponential model (DFOP = double first order parallel) may be used to adequately describe the experimental residue values of the applied parent substance. These models use increasing numbers of parameters to describe degradation.

The objective of a kinetic evaluation is to select appropriate kinetic models in order to derive degradation endpoints from their respective calculations. These degradation endpoints, namely the DT_{50} and DT_{90} parameters from dissipation and the $DegT_{50}$ and $DegT_{90}$ for degradation, are established differently depending on whether one considers these parameters to assess if further persistence studies are needed (trigger endpoints) or one plans to use them as inputs for pesticide fate models (modelling endpoints). Both options are considered here. As defined in the FOCUS guidance, for modelling endpoints, if the SFO model is deemed sufficiently descriptive then the corresponding DT_{50} parameter is taken; if not, FOMC, DFOP and HS kinetics are tested. For trigger endpoints, SFO and FOMC kinetics are tested in a first step; if SFO is not acceptable or worse than FOMC, DFOP and HS kinetics are tested, too.

II. RESULTS AND DISCUSSION

For Prothioconazole the trigger and modelling endpoints and the statistical parameters for the whole system are given in Table 7.2.2.3- 9, for the water layer in Table 7.2.2.3- 10 and for the sediment in Table 7.2.2.3- 11, respectively.

For JAU 6476-S-methyl *(M01)* the trigger and modelling endpoints and the statistical parameters for the whole system are given in Table 7.2.2.3- 12, for the water layer in Table 7.2.2.3- 13 and for the sediment in Table 7.2.2.3- 14, respectively.

The data for JAU 6476-desthio *(M04)* are summarised in Table 7.2.2.3- 15 for the whole system, in Table 7.2.2.3- 16 for the water and in Table 7.2.2.3- 17 for the sediment, respectively.

For the metabolites 1,2,4-Triazole *(M13)* and JAU 6476-triazolylketone *(M42)* the data for the whole system (only data including parent, parent parameters fixed) are given in Table 7.2.2.3- 18 and Table 7.2.2.3- 19. For these metabolites data from for the water layer in and the sediment were not evaluated.

The estimated formation fractions of the major prothioconazole metabolites from the total systems are given in Table 7.2.2.3- 20.

- **Prothioconazole**

Table 7.2.2.3- 9: Dissipation of prothioconazole in whole system
P-I-level (best fits highlighted in **bold letters**)

Model[a]	DT_{50} [days]	DT_{90} [days]	M_0 [%]	k_1 / α	k_2 / β	tb / g	p k_1/α	p k_2/β	Visual fit[b]	χ^2
[redacted], phenyl label										
SFO	7.54	25.1	60.5	0.0919	---[c]	---[c]	0.0398	---[c]	--[d]	31.1[d]
FOMC	**1.45**	276	80.8	0.314	0.178	---[c]	---[c]	---[c]	+	7.59
DFOP	1.17	71.9	80.8	1.450	0.0192	0.601	0.0159	0.0137	+	8.73
HS	1.07	69.6	80.9	0.646	0.0202	1.43	0.0022	0.0128	o	8.96
► SFO fit not acceptable, 10% of initial concentration reached at the end of study, therefore fit of HS, FOMC and DFOP; FOMC provides best fit, back calculation of DT_{50} modelling endpoint from DT_{90}										
► **Conclusion**: Trigger endpoint: FOMC, DT_{50}: 1.45 d Modelling endpoint: FOMC, DT_{50}: **83.1 d** (DT_{90} / 3.32)										
[redacted], triazole label										
SFO	3.90	13.0	68.3	0.178	---[c]	---[c]	0.0521[d]	---[c]	--[d]	37.1[d]
FOMC	0.810	293	85.8	0.277	0.0724	---[c]	---[c]	---[c]	++	6.85
DFOP	**0.909**	96.7	85.8	1.42	0.0119	0.684	0.0011	0.0039	++	5.12
HS	0.936	95.3	85.8	0.7409	0.0122	1.56	<0.001	0.0035	++	5.17
► SFO fit not acceptable, 10% of initial concentration reached at the end of study, therefore fit of HS, FOMC and DFOP; DFOP provides best fit (best χ^2 value), back calculation of DT_{50} modelling endpoint from DT_{90}										
► **Conclusion**: Trigger endpoint: DFOP, DT_{50}: 0.909 d Modelling endpoint: DFOP, DT_{50}: **29.1** d (DT_{50} = DT_{90} / 3.32)										
[redacted], phenyl label										
SFO	1.45	4.81	97.5	0.478	---[c]	---[c]	0.001	---[c]	--	18.4[d]
FOMC	1.06	11.6	101	0.859	0.8542	---[c]	---[c]	---[c]	+	5.79
DFOP	**1.20**	16.5	100	0.709	0.0166	0.869	<0.001	0.042	+	5.49
HS	1.33	15.8	98.8	0.521	0.0149	4.08	<0.001	0.132[d]	o	9.27
► SFO fit not acceptable, 10% of initial concentration reached at the end of study, therefore fit of HS, FOMC and DFOP; DFOP provides best fit (χ^2 value), back calculation of DT_{50} modelling endpoint from DT_{90}										
► **Conclusion**: Trigger endpoint: DFOP, DT_{50}: 1.20 d, Modelling endpoint: DFOP, DT_{50}: **4.97** d (DT_{50} = DT_{90} / 3.32)										
[redacted], triazole label										
SFO	1.54	5.12	97.6	0.450	---[c]	---[c]	<0.001	---[c]	-[d]	16.4[d]
FOMC	1.20	10.9	101	0.988	1.18	---[c]	---[c]	---[c]	+	7.63
DFOP	**1.33**	11.3	99.7	0.623	0.0131	0.885	<0.001	0.008	++	2.72
HS	1.43	13.6	98.8	0.486	0.0139	4.47	<0.001	0.063[d]	+	5.93
► SFO fit not acceptable, 10% of initial concentration reached at the end of study, therefore fit of HS, FOMC and DFOP, DFOP provides best fit, back calculation of DT_{50} modelling endpoint from DT_{90}										
► **Conclusion**: Trigger endpoint: DFOP, DT_{50}: 1.33 d Modelling endpoint: DFOP, DT_{50}: **3.40** d (DT_{50} = DT_{90} / 3.32)										

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor
c) not relevant for this case, e.g. k_2 for SFO kinetics
d) this case fails due to e.g. bad visual fit, high χ^2 values or a significance level (p) higher than 0.1

Table 7.2.2.3- 10: Dissipation of prothioconazole in water
P-I-level (best fits highlighted in **bold letters**)

Model[a)]	DT_{50} [days]	DT_{90} [days]	M_0 [%]	k_1 / α	k_2 / β	tb / g	p k_1/α	p k_2/β	Visual fit[b)]	χ^2
[redacted], phenyl label										
SFO	0.525	1.75	80.5	1.32	---[c)]	---[c)]	<0.001	---[c)]	-[d)]	23.6[d)]
FOMC	0.280	3.89	80.9	0.737	0.179	---[c)]	---[c)]	---[c)]	+	7.42
DFOP	0.129	5.09	80.9	9.20	0.210	0.709	0.488[d)]	<0.001	++	2.70
HS	**0.480**	5.09	80.9	1.44	0.210	1.00	<0.001	<0.001	++	2.70
► SFO fit visually and statistically not acceptable, 10% of initial concentration reached at the end of study, therefore fit of HS, FOMC and DFOP, HS provides best fit, back-calculation of DT_{50} modelling from DT_{90}										
► **Conclusion**: Trigger endpoint: HS, DT_{50}: **0.480** d Modelling endpoint: HS, DT50: **1.53** d (DT_{50} = DT_{90} / 3.32)										
[redacted] triazole label										
SFO	0.480	1.60	85.6	1.44	---[c)]	---[c)]	0.001	---[c)]	-[d)]	24.4[d)]
FOMC	0.210	3.87	85.9	0.636	0.107	---[c)]	---[c)]	---[c)]	+	7.39
DFOP	**0.268**	5.56	85.9	3.76	0.146	0.774	0.0199	0.0024	++	3.72
HS	0.448	5.56	85.9	1.55	0.146	1.06	<0.001	0.0024	++	3.72
► SFO fit visually and statistically not acceptable, 10% of initial concentration reached at the end of study, therefore fit of HS, FOMC and DFOP, DFOP provides best fit, back calculation of DT_{50} modelling endpoint from DT_{90}										
► **Conclusion**: TRigger endpoint: DFOP, DT_{50}: **0.268** d Modelling endpoint: DFOP, DT_{50}: **1.68 d** (DT_{50} = DT_{90} / 3.32)										
[redacted], phenyl label										
SFO	0.657	2.18	100	1.05	---[c)]	---[c)]	<0.001	---[c)]	o	9.71
FOMC	**0.556**	2.86	101	2.06	1.39	---[c)]	---[c)]	---[c)]	+	1.70
DFOP	0.565	2.96	101	1.83	0.417	0.667	0.0011	0.002	+	1.64
HS	0.657	2.18	100	1.06	0.0787	3.65	<0.001	0.420[d)]	+	10.7
► SFO fit visually and statistically acceptable, 10% of initial concentration reached at the end of study, therefore fit of HS, FOMC and DFOP; for FOMC the distribution of residuals looks slightly better than for DFOP, but the difference is marginal, back-calculation of DT_{50} modelling endpoint from DT_{90}										
► **Conclusion**: Trigger endpoint: FOMC, DT_{50}: **0.556** d, Modelling endpoint: FOMC, DT_{50}: **0.861** d (DT_{50} = DT_{90} / 3.32)										
[redacted], triazole label										
SFO	0.787	2.62	99.5	0.880	---[c)]	---[c)]	<0.001	---[c)]	+	7.10
FOMC	**0.710**	3.15	100	3.00	2.73	---[c)]	---[c)]	---[c)]	+	1.61
DFOP	0.713	3.18	100	1.41	0.426	0.640	0.0022	0.006	+	1.94
HS	0.786	2.61	99.5	0.882	0.0363	4.65	<0.001	0.393[d)]	+	7.54
► SFO fit visually and statistically good, 10% of initial concentration reached at the end of study, therefore fit of HS, FOMC and DFOP; FOMC provides best fit, back calculation of DT_{50} modelling endpoint from DT_{90}										
► **Conclusion**: Trigger endpoint: FOMC, DT_{50}: **0.710** d Modelling endpoint: FOMC, DT_{50}: **0.949** d (DT_{50} = DT_{90} / 3.32)										

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor
c) not relevant for this case, e.g. k_2 for SFO kinetics
d) this case fails due to e.g. bad visual fit, high χ^2 values or a significance level (p) higher than 0.1

Table 7.2.2.3- 11: Dissipation of prothioconazole in sediment
P-I-level (best fits highlighted in **bold letters**)

Model[a)]	DT_{50} [days]	DT_{90} [days]	M_0 [%]	k_1 / α	k_2 / β	tb / g	p k_1/α	p k_2/β	Visual fit[b)]	χ^2
[redacted] phenyl label										
SFO	**60.2**	200	23.0	0.0115	---[c)]	---[c)]	0.0071	---[c)]	+	11.4
FOMC	57.9	435	23.7	1.12	64.2	---[c)]	---[c)]	---[c)]	+	11.3
► SFO fit visually and statistically good										
► **Conclusion**: Trigger endpoint: SFO, DT50: 60.2 d Modelling endpoint: SFO, DT50: 60.2 d										
[redacted], triazole label										
SFO	91.8	305	19.8	0.008	---[c)]	---[c)]	0.018	---[c)]	o	12.3
SFO[e)]	**76.2**	253	21.8	0.009	---[c)]	---[c)]	0.001	---[c)]	+	5.53
FOMC	91.8	305	19.9	1882	249200	---[c)]	---[c)]	---[c)]	o	13.3
FOMC[e)]	75.6	270	21.8	11.4	1204	---[c)]	---[c)]	---[c)]	+	6.08
► SFO fit with outlier on day 3 excluded provides visually and statistically good fit										
► **Conclusion**: Trigger endpoint: SFO, DT_{50}: **76.2** d Modelling endpoint: SFO, DT_{50}: **76.2** d										
[redacted], phenyl label										
SFO	14.8	49.2	18.1	0.0468	---[c)]	---[c)]	0.0177	---[c)]	-[d)]	19.8[d)]
FOMC	**7.36**	343	21.0	0.446	1.97	---[c)]	---[c)]	---[c)]	++	3.25
DFOP	7.21	195	20.6	0.194	0.0066	0.642	0.008	0.04	++	4.48
HS	4.38	123	21.0	0.158	0.0133	4.604	0.053	0.04	o	10.5
► 10% of initial mass (i.e. of max. in sed) are not reached at end of study, so only slow phase of either HS or DFOP may be considered for modelling endpoints; for trigger endpoints, FOMC (best fit) is visually and statistically very good										
► **Conclusion**: Trigger endpoint: FOMC, DT_{50}: **7.36** d Modelling endpoint: DFOP, slow phase, DT_{50}: **106** d										
[redacted], triazole label										
SFO	21.4	71.11	15.5	0.0324	---[c)]	---[c)]	0.017	---[c)]	-[d)]	18.4[d)]
FOMC	9.59	473	18.4	0.4383	2.4834	---[c)]	---[c)]	---[c)]	++	3.92
DFOP	**8.36**	181	18.4	0.2181	0.0082	0.562	0.005	0.0089	++	3.23
HS	7.30	171	18.1	0.0950	0.0091	8.71	0.001	0.0057	+	3.45
► 10% of initial mass (i.e. of max. in sed.) are not reached at end of study, so only slow phase of either HS or DFOP may be considered for modelling endpoints, for trigger endpoints DFOP (best fit, better χ2 value) is acceptable										
► **Conclusion**: Trigger endpoint: DFOP, DT_{50}: **8.36** d Modelling endpoint: DFOP, slow phase, DT_{50}: **84.7 d**										

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: + = good, o = moderate, - = poor
c) not relevant for this case, e.g. k_2 for SFO kinetics
d) this case fails due to e.g. bad visual fit, high χ^2 values or a significance level (p) higher than 0.1
e) day 3 excluded as outlier, but outlier test failed

- **JAU 6476-S-methyl *(M01)***

Table 7.2.2.3- 12: Dissipation of JAU 6476-S-methyl *(M01)* in whole system M-I-level, including parent, parent parameters fixed (best fits highlighted in **bold letters**)

Model[a]		System			
		[redacted] phenyl label	triazole label	[redacted] phenyl label	triazole label
SFO	Parent	FOMC	DFOP	DFOP	DFOP
	DT_{50} [d]	**180**	**134**	**44.8**	**39.5**
	DT_{90} [d]	597	445		
	k	0.0039	0.00518	0.0155	0.0176
	ff	0.0777	0.0713	0.113	0.130
	t-test (k)	0.00065	0.000907	6.28E-10	0.000425
	Std. Error (ff)	0.0038	0.00430	0.00410	0.0121
	visual fit[b]	+	o	+	+
	χ^2 value	7.52	9.49	6.29	16.1
►		SFO fit visually and statistically good	SFO fit visually and statistically acceptable	SFO fit visually and statistically good	SFO fit visually and statistically good
► **Conclusion:**					
	Trigger endpoint:	SFO, DT_{50}: 180 d	SFO, DT_{50}: 134 d	SFO, DT_{50}: 44.8 d	SFO, DT_{50}: 39.5 d
	Modelling endpoint:	SFO, DT_{50}: 180 d	SFO, DT_{50}: 134 d	SFO, DT_{50}: 44.8 d	SFO, DT_{50}: 39.5 d

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: ++ = very good, + = good, o = moderate, - = poor

Table 7.2.2.3- 13: Dissipation of JAU 6476-S-methyl *(M01)* in water
M-I-level, decline of metabolite in water from max. onwards
metabolite fitted separately, all data **(**best fits highlighted in **bold letters**)

Model[a]		System			
		[redacted]		[redacted]	
		phenyl label	triazole label	phenyl label	triazole label
SFO	DT_{50} [d]	5.12	**9.17**	**11.6**	**11.9**
	DT_{90} [d]	17.0	30.5	38.6	39.4
	M0	0.778	0.803	2.42	2.85
	k	0.136	0.0756	0.0597	0.0585
	t-test (k)	0.00590	2.00E-06	0.00351	0.0395
	visual fit[b]	-[c]	o	+	o[c]
	χ^2 value	12.0[c]	1.69	9.57	23.6[c]
FOMC	DT_{50} [d]	4.03	8.96	9.98	6.53
	DT_{90} [d]	28.8	31.9	46.6	72.5
	M0	0.800	0.807	2.47	3.08
	alpha	1.25	11.7	2.59	0.851
	beta	5.47	146	32.5	5.19
	St.Dev (alpha)	0.172	9.35[c]	2.48[c]	0.754[c]
	St.Dev (beta)	1.20	124[c]	39.5[c]	8.85[c]
	visual fit	++	++	+	o
	χ^2 value	2.34	1.52	8.94	19.6[c]
DFOP	DT_{50} [d]	**3.99**	0.00	9.92	3.95
	DT_{90} [d]	307	31.6	46.0	60.6
	M0	0.801	0.806	2.50	3.10
	k1	0.298	0.0793	3.27	4.18
	k2	0.0419	2.22E-14	0.0446	0.0284
	g	0.639	0.980	0.222	0.441
	t-test (k1)	0.0172	0.00528	0.001	1.30E-14
	t-test (k2)	0.0229	0.500[c]	0.0660[c]	0.175[c]
	visual fit	++	++	+	o
	χ^2 value	0.673	1.39	6.27	15.7[c]
►		DFOP provides best fit	SFO fit good	SFO fit good	Considering the low number of data points and the scattering of the data, SFO might still be considered acceptably since the degradation in general is acceptably reproduced; DFOP has an acceptable chi², but k2 is not well fit and the break caused by the change from k1 to k2 makes no sense
► **Conclusion:**					
Trigger endpoint:		DFOP, DT_{50}: 3.99 d	SFO, DT_{50}: 9.17 d	SFO, DT_{50}: 11.6 d	SFO, DT_{50}: 11.9 d
Modelling endpoint:		DFOP, DT_{50}: 9.23 d[d]	SFO, DT_{50}: 9.17 d	SFO, DT_{50}: 11.6 d	SFO, DT_{50}: 11.9 d

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: ++ = very good, + = good, o = moderate, - = poor
c) this case fails due to e.g. bad visual fit, high χ^2 values or a significance level (p) higher than 0.1
d) back calculated from DT_{90} (DT_{50} = DT_{90} / 3.32)

Table 7.2.2.3- 14: Dissipation of prothioconazole JAU 6476-S-methyl *(M01)* in sediment M-I-level, decline of metabolite in sediment from max. onwards
metabolite fitted separately, all data **(**best fits highlighted in **bold letters**)

Model[a)]		System			
		[redacted]		[redacted]	
		phenyl label	**triazole label**	**phenyl label**	**triazole label**
SFO	DT_{50} [d]	Evaluation not possible for any of the metabolites (evaluation of sediment dissipation makes no sense since there is no dissipation until the end of the study).		**59.3**	**48.4**
	DT_{90} [d]			197	161
	M0			7.27	8.86
	k			0.0117	0.0143
	t-test (k)			0.0146	0.0295
	visual fit[b)]			o	o
	χ^2 value			6.10	14.1
FOMC	DT_{50} [d]			59.3	48.1
	DT_{90} [d]			197	164
	M0			7.27	8.87
	alpha			161800	28.7
	beta			3840000	1965
	St.Dev (alpha)			4.34E-06	1222[c)]
	St.Dev (beta)			5.07E-08	85300[c)]
	visual fit			+	+
	χ^2 value			7.62	16.1[c)]
DFOP	DT_{50} [d]			no DFOP fit, as there are only four data points	42.3
	DT_{90} [d]				175
	M0				9.60
	k1				3.20
	k2				0.0121
	g				0.165
	t-test (k1)				<0.001
	t-test (k2)				0.188[c)]
	visual fit				o[c)]
	χ^2 value				17.7[c)]
►				SFO fit visually and statistically good	SFO fit visually and statistically good
► **Conclusion:**					
Trigger endpoint:				SFO, DT_{50}: 59.3 d	SFO, DT_{50}: 48.4 d
Modelling endpoint:				SFO, DT_{50}: 59.3 d	SFO, DT_{50}: 48.4 d

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: ++ = very good, + = good, o = moderate, - = poor
c) this case fails due to e.g. bad visual fit, high χ^2 values or a significance level (p) higher than 0.1

- **JAU 6476-desthio *(M04)***

Table 7.2.2.3- 15: Dissipation of prothioconazole JAU 6476-desthio *(M04)* in whole system M-I-level, including parent, parent parameters fixed
(best fits highlighted in **bold letters**)

Model[a]		**System** [redacted]		[redacted]	
		phenyl label	**triazole label**	**phenyl label**	**triazole label**
SFO	Parent	FOMC	DFOP	DFOP	DFOP
	DT_{50} [d]	93.8	**75.8**	**42.6**	**39.1**
	DT_{90} [d]	312	252		
	k	0.0074	0.00914	0.0163	0.0178
	ff	0.407	0.359	0.691	0.704
	t-test (k)	0.0093	0.001	3.68E-10	3.28E-11
	Std. Error (ff)	0.0432	0.0173	0.0257	0.0267
	visual fit[b]	-[c]	+	+	++
	χ^2 value	16.6[c]	7.82	6.29	5.76
►		SFO fit visually and statistically not acceptable	SFO fit visually and statistically good	SFO fit visually and statistically good	SFO fit visually and statistically very good
► **Conclusion:**					
Trigger endpoint:		-	SFO, DT_{50}: 75.8 d	SFO, DT_{50}: 42.6 d	SFO, DT_{50}: 39.1 d
Modelling endpoint:		-	SFO, DT_{50}: 75.8 d	SFO, DT_{50}: 42.6 d	SFO, DT_{50}: 39.1 d

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: ++ = very good, + = good, o = moderate, - = poor
c) this case fails due to e.g. bad visual fit, high χ^2 values or a significance level (p) higher than 0.1

Table 7.2.2.3- 16: Dissipation of prothioconazole JAU 6476-desthio *(M04)* in water M-I-level, decline of metabolite in water from max. onwards
metabolite fitted separately, all data (best fits highlighted in **bold letters**)

Model[a)]		System			
		[redacted]		[redacted]	
		phenyl label	**triazole label**	**phenyl label**	**triazole label**
SFO	DT_{50} [d]	3.67	9.05	**27.7**	**30.6**
	DT_{90} [d]	12.2	30.05	92.0	101.7
	M0	12.8	7.67	32.5	33.1
	k	0.189	0.0766	0.0250	0.0226
	t-test (k)	0.00334	0.0139	0.00254	<0.001
	visual fit[b)]	-[c)]	-[c)]	+	++
	χ^2 value	19.9[c)]	22.4[c)]	6.78	5.43
FOMC	DT_{50} [d]	**2.38**	3.74	27.7	30.6
	DT_{90} [d]	35.0	83.1	92.0	102
	M0	14.0	9.05	32.5	33.1
	alpha	0.715	0.584	10660	12210
	beta	1.46	1.64	425900	539200
	St.Dev (alpha)	0.120	0.213	1760	1501
	St.Dev (beta)	0.517	1.40	44.0	34.0
	visual fit	++	o	+	+
	χ^2 value	7.05	14.3	7.75	5.80
DFOP	DT_{50} [d]	2.33	**3.91**	27.7	30.6
	DT_{90} [d]	46.4	44.8	92.0	102
	M0	13.9	9.20	32.5	33.1
	k1	0.473	13.2	0.0250[c)]	2.22E-14
	k2	0.0215	0.0393	0.0250[c)]	0.0226
	g	0.729	0.417	0.0308	2.88E-14
	t-test (k1)	0.00288	<0.001	0.00392	0.500[c)]
	t-test (k2)	0.0306	<0.001	0.0753	0.0403
	visual fit	+	+	+	+
	χ^2 value	6.73	2.79	9.67	6.83
►		FOMC provides best fit (visually better though χ^2 value worse)	SFO fit not acceptable, DFOP provides best fit	SFO fit good	SFO very good
► **Conclusion:** Trigger endpoint:		FOMC, DT_{50}: 2.38 d	DFOP, DT_{50}: 3.91 d	SFO, DT_{50}: 27.7 d	SFO, DT_{50}: 30.6 d
Modelling endpoint:		FOMC, DT_{50}: 14.0 d[d)]	DFOP, DT_{50}: 13.5 d[d)]	SFO, DT_{50}: 27.7 d	SFO, DT_{50}: 30.6 d

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: ++ = very good, + = good, o = moderate, - = poor
c) this case fails due to e.g. bad visual fit, high χ^2 values or a significance level (p) higher than 0.1
d) back calculated from DT_{90} (DT_{50} = DT_{90} / 3.32)

Table 7.2.2.3- 17: Dissipation of prothioconazole JAU 6476-desthio *(M04)* in sediment M-I-level, decline of metabolite in sediment from max. onwards metabolite fitted separately, all data (best fits highlighted in **bold letters**)

Model[a)]		System			
		[redacted]		[redacted]	
		phenyl label	triazole label	phenyl label	triazole label
SFO	DT_{50} [d]	Evaluation not possible for any of the metabolites (evaluation of sediment dissipation makes no sense since there is no dissipation until the end of the study).		**62.0**	**52.3**
	DT_{90} [d]			206	174
	M0			27.8	27.7
	k			0.0112	0.0133
	t-test (k)			0.0062	0.0101
	visual fit[b)]			+	+
	χ^2 value			3.85	5.33
FOMC	DT_{50} [d]			62.0	52.3
	DT_{90} [d]			206	174
	M0			27.8	27.7
	alpha			3386	1135
	beta			303000	85590
	St.Dev (alpha)			540	1048000[c)]
	St.Dev (beta)			6.03	79080000[c)]
	visual fit			+	+
	χ^2 value			4.81	6.66
DFOP	DT_{50} [d]			no DFOP fit, as there are only four data points	51.7
	DT_{90} [d]				185
	M0				27.8
	k1				2.22E-14[c)]
	k2				0.0139
	g				0.0255[c)]
	t-test (k1)				0.500[c)]
	t-test (k2)				0.500[c)]
	visual fit				+
	χ^2 value				not available[c)]
►				SFO fit visually and statistically good	SFO fit visually and statistically good
► Conclusion: Trigger endpoint:		--	--	SFO, DT_{50}: 62.0 d	SFO, DT_{50}: 52.3 d
Modelling endpoint:		--	--	SFO, DT_{50}: 62.0 d	SFO, DT_{50}: 52.3 d

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: ++ = very good, + = good, o = moderate, - = poor
c) this case fails due to e.g. bad visual fit, high χ^2 values or a significance level (p) higher than 0.1

- **1,2,4-Triazole *(M13)***

Table 7.2.2.3- 18: Dissipation of 1,2,4-triazole *(M13)* in whole system M-I-level, including parent, parent parameters fixed

Model[a]		System [redacted]		[redacted]	
			triazole label		triazole label
SFO	Parent		DFOP		DFOP
	DT_{50} [d]		Inf[c]		??[c]
	DT_{90} [d]		Inf[c]		??[c]
	k		0[c]		0[c]
	ff		0.352		0.529
	t-test (k)		0.500[c]		0.500[c]
	Std. Error (ff)		0.105		0.184
	visual fit[b]		--		--
	χ^2 value		35.5[c]		49.6
►			SFO fit visually and statistically not acceptable		No degradation visible
► **Conclusion:**					
Trigger endpoint:		-	-	-	-
Modelling endpoint:		-	-	-	-

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: ++ = very good, + = good, o = moderate, - = poor
c) this case fails due to e.g. bad visual fit, high χ^2 values or a significance level (t) higher than 0.1

- **JAU 6476-triazolylketone *(M42)***

Table 7.2.2.3- 19: Dissipation of JAU 6476-triazolylketone *(M42)*[d)] in whole system M-I-level, including parent, parent parameters fixed

Model[a)]		System			
		[redacted]		[redacted]	
			triazole label		triazole label
SFO	Parent		DFOP		DFOP
	DT_{50} [d]		20.28[c)]		15.82[c)]
	DT_{90} [d]		67.37[c)]		
	k		0.0342[c)]		0.0438[c)]
	ff		0.91 (from Desthio)		0.694 (from Desthio)
	t-test (k)		0.256[c)]		0.143[c)]
	Std. Error (ff)		1.081		0.513
	visual fit[b)]		--		--
	χ^2 value		75.5		76.57[c)]
►			SFO fit visually and statistically not acceptable		
► **Conclusion:** Trigger endpoint:		-	-	-	-
Modelling endpoint:		-	-	-	-

a) SFO: single first order, FOMC: first order multi compartment, DFOP: double first order in parallel
b) visual fit: ++ = very good, + = good, o = moderate, - = poor
c) this case fails due to e.g. bad visual fit, high χ^2 values or a significance level (p) higher than 0.1
d) the fit for JAU 6476-triazolylketone was done based on the following path: prothioconazole → JAU 6476-desthio → JAU 6476-triazolylketone → 1,2,4-triazole → CO_2, here only the JAU 6476-triazolylketone results are presented from this fit

- **Formation fractions**

Table 7.2.2.3- 20: Estimated formation fractions of major prothioconazole metabolites from the total system

	Formation fractions[a)]				
	[redacted]		[redacted]		**Arithemtic mean**
	phenyl label	**triazole label**	**phenyl label**	**triazole label**	
Parent to JAU 6476-S-methyl *(M01)*	0.078 ± 0.0038	0.073 ± 0.0043	0.113 ± 0.0041	0.130 ± 0.0121	0.098
Parent to JAU 6476-desthio *(M04)*	0.407 ± 0.0432	0.359 ± 0.0173	0.691 ± 0.0257	0.704 ± 0.0267	0.540
JAU 6476-desthio *(M04)* to 1,2,4-triazole *(M13)*	---	0.352 ± 0.105	---	0.529 ± 0.184	0.440

a) values in the table are estimated formation fractions ± standard deviation as given in KinGUI

III. CONCLUSIONS

For trigger evaluation the half-lives of prothioconazole were between 0.9 and 1.45 days in the total system (geometric mean 1.2 days), between 0.3 and 0.7 days in the water (geometric mean 0.48 days) and between 7.4 and 76.2 days in the sediment (geometric mean 23.05 days).
The half-lives of JAU 6476-S-methyl *(M01)* were between 39.5 and 180 days in the total system (geometric mean 80.7 days), between 4.0 and 11.9 days in the water (geometric mean 8.43 days) and between 48.4 and 59.3 days in the sediment (geometric mean 53.6 days).

The half-lives of JAU 6476-desthio *(M04)* were between 39.1 and 75.8 days in the total system (geometric mean 55.6 days), between 2.4 and 30.6 days in the water (geometric mean 9.42 days) and between 52.3 and 62.0 days in the sediment (geometric mean 57.0 days).
For the metabolite 1,2,4-triazole *(M13)* the evaluation for the half-lives for trigger evaluation was not possible.
For modelling evaluation the half-lives of prothioconazole were between 3.4 and 83.1 days in the total system (geometric mean 14.2 days), between 0.9 and 1.7 days in the water (geometric mean 1.2 days) and between 60.2 and 106 days in the sediment (geometric mean 80.1 days).
The half-lives of JAU 6476-S-methyl *(M01)* were between 39.5 and 180 days in the total system (geometric mean 80.7 days), between 9.2 and 11.9 days in the water (geometric mean 10.4 days) and between 48.4 and 59.3 days in the sediment (geometric mean 53.6 days).
The half-lives of JAU 6476-desthio *(M04)* were and between 39.1 and 75.8 days in the total system (geometric mean 55.6 days), between 13.5 and 30.6 days in the water (geometric mean 20 days) and between 52.3 and 62.0 days in the sediment (geometric mean 57 days).
For the metabolite 1,2,4-triazole *(M13)* the evaluation for the half-lives for modelling evaluation was not possible.

CA 7.2.2.4 Irradiated water/sediment study

The route and rate of degradation of prothioconazole in water and sediment were comprehensively studied in sections CA 7.2.1, CA 7.2.2.2 and CA 7.2.2.3. Therefore, the route and rate of degradation of prothioconazole in irradiated water/sediment systems were not studied. A summary of the route and rate of degradation of prothioconazole in water and sediment is given in section CA 7.2 and Figure 7.2-1.

CA 7.2.3 Degradation in the saturated zone

The degradation of prothioconazole in the saturated zone was not studied since prothioconazole is not expected to reach the saturated zone after its use according to good agricultural practices. A summary of the route and rate of degradation of prothioconazole in water and sediment is given in section CA 7.2 and Figure 7.2-1.

CA 7.3 Fate and behaviour in air

Prothioconazole has a very low vapour pressure of << 4 × 10^{-7} Pa. Therefore, it can be concluded that significant volatilisation of prothioconazole is not to be expected.
In addition, estimates of the chemical lifetime in the troposphere resulted in half-lives < 1 day for prothioconazole and also for its metabolites JAU 6476-desthio *(M04)*.

CA 7.3.1 Route and rate of degradation in air

The degradation rates of prothioconazole and its metabolites JAU 6476-desthio *(M04)* in air were evaluated during the Annex I inclusion using the Atkinson method, and were accepted by the European Commission (EFSA Scientific Report (2007) 106, 1-98, 12 July 2007). The following study is included in the Baseline Dossier:

Annex Point / Reference No	Author(s)	Year	Document No
Prothioconazole			
KCA 7.3.1 /01	[redacted], E.	1998	M-007816-01-1
JAU 6476-desthio *(M04)*			
KCA 7.3.1 /02	[redacted], E.	2000	M-040725-01-1

No additional studies are submitted within this Supplemental Dossier for the prothioconazole renewal of approval. A short summary of the behaviour of prothioconazole and its metabolites JAU 6476-desthio *(M04)* in air is given in section CA 7.3.

CA 7.3.2 Transport via air

The transport via air of prothioconazole was not studied since its vapour pressure is below the trigger value of 10^{-5} Pa.

CA 7.3.3 Local and global effects

On account of the short chemical lifetime of prothioconazole and JAU 6476-desthio *(M04)* in the air it is to be expected that the substances cannot be transported in the gaseous phase over large distances or can accumulate in the air. Thus, no difference in the behaviour between prothioconazole, JAU 6476-desthio *(M04)* and other organic substances emitted into the air from natural sources (e.g. from plants and soil) is indicated.

CA 7.4 Definition of the residue

CA 7.4.1 Definition of the residue for risk assessment

The proposed residue definitions relevant for risk assessment for each compartment are the following:

Compartment	Residue definition for risk assessment
Soil	Prothioconazole, JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)*
Groundwater	Prothioconazole, JAU 6476-S-methyl *(M01)* and JAU 6476-desthio *(M04)*
Surface water	Prothioconazole, JAU 6476-S-methyl *(M01)*, JAU 6476-desthio *(M04)*, JAU 6476-thiazocine *(M12)*, 1,2,4-triazole *(M13)* and JAU 6476-triazolylketone *(M42)*
Sediment	Prothioconazole, JAU 6476-S-methyl *(M01)*, JAU 6476-desthio *(M04)*, JAU 6476-thiazocine *(M12)*, 1,2,4-triazole *(M13)* and JAU 6476-triazolylketone *(M42)*
Air	Prothioconazole and JAU 6476-desthio *(M04)*

CA 7.4.2 Definition of the residue for monitoring

The enforcement method for soil includes the active substance and the relevant metabolite JAU 6476-desthio *(M04)*.

The enforcement method for water includes the active substance and the relevant metabolite JAU 6476-desthio *(M04)*.

The relevant residue with regard to quantification in air is the parent compound only. None of the environmental fate studies indicated volatile metabolites other than CO_2. In addition, a method for the determination of JAU 6476-desthio *(M04)* in air is available.

CA 7.5 Monitoring data

Laboratory and field data demonstrated the degradability of prothioconazole and its residues in the various compartments of the environment, with no indications for persistence or accumulation.
Under recommended use conditions, no unacceptable leaching of parent compound or of any relevant degradates to groundwater is to be expected.
Therefore monitoring studies under outdoor conditions were considered to be not required.