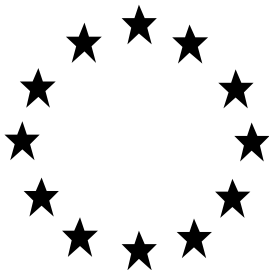
Directive 98/8/EC concerning the placing of biocidal products on the market

Inclusion of active substances in Annex I to Directive 98/8/EC

Assessment Report



Pyriproxyfen

Product-type 18 (Insecticides, acaricides and products to control other arthropods)

21 September 2012

Annex I - The Netherlands

Pyriproxyfen (PT 18)

Assessment report

Finalised in the Standing Committee on Biocidal Products at its meeting on 21 September 2012 in view of its inclusion in Annex I to Directive 98/8/EC

CONTENTS

1. STATEMENT OF SUBJECT MATTER AND PURPOSE

1.1. Procedure followed

This assessment report has been established as a result of the evaluation of Pyriproxyfen as product-type 18 (Insecticides, acaricides and products to control other arthropods), carried out in the context of the work programme for the review of existing active substances provided for in Article 16(2) of Directive 98/8/EC concerning the placing of biocidal products on the market[1], with a view to the possible inclusion of this substance into Annex I or IA to the Directive.

Pyiproxyfen (CAS no. 95737-68-1) was notified as an existing active substance, by Sumitomo Chemical (UK) PLC, hereafter referred to as the applicant, in product-type 18.

Commission Regulation (EC) No 1451/2007 of 4 November 2003[2] lays down the detailed rules for the evaluation of dossiers and for the decision-making process in order to include or not an existing active substance into Annex I or IA to the Directive.

In accordance with the provisions of Article 7(1) of that Regulation, The Netherlands was designated as Rapporteur Member State to carry out the assessment on the basis of the dossier submitted by the applicant. The deadline for submission of a complete dossier for Pyriproxyfen as an active substance in Product Type 18 was 30 April 2006, in accordance with Annex V of Regulation (EC) No 1451/2007.

On 1 May 2006, the Rapporteur Member State received a dossier from the applicant. The Rapporteur Member State accepted the dossier as complete for the purpose of the evaluation on 2 October 2006.

On 1 October 2009, the Rapporteur Member State submitted, in accordance with the provisions of Article 14(4) and (6) of Regulation (EC) No 1451/2007, to the Commission and the applicant a copy of the evaluation report, hereafter referred to as the competent authority report. The Commission made the report available to all Member States by electronic means on 12 October 2009. The competent authority report included a recommendation for the inclusion of Pyriproxyfen in Annex I to the Directive for product-type 18.

In accordance with Article 16 of Regulation (EC) No 1451/2007, the Commission made the competent authority report publicly available by electronic means on 12 October 2009. This report did not include such information that was to be treated as confidential in accordance with Article 19 of Directive 98/8/EC.

In order to review the competent authority report and the comments received on it, consultations of technical experts from all Member States (peer review) were organised by the Commission. Revisions agreed upon were presented at technical and competent authority meetings and the competent authority report was amended accordingly.

1 Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 concerning the placing biocidal products on the market. OJ L 123, 24.4.98, p.1

2 Commission Regulation (EC) No 1451/2007 of 4 December 2007 on the second phase of the 10-year work programme referred to in Article 16(2) of Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market. OJ L 325, 11.12.2007, p. 3

On the basis of the final competent authority report, the Commission proposed the inclusion of Pyriproxyfen in Annex I to Directive 98/8/EC and consulted the Standing Committee on Biocidal Product on 21 September 2012.
In accordance with Article 15(4) of Regulation (EC) No 1451/2007, the present assessment report contains the conclusions of the Standing Committee on Biocidal Products, as finalised during its meeting held on 21 September 2012.

1.2. Purpose of the assessment report

This assessment report has been developed and finalised in support of the decision to include Pyriproxyfen in Annex I to Directive 98/8/EC for product-type 18. The aim of the assessment report is to facilitate the authorisation in Member States of individual biocidal products in product-type 18 that contain Pyriproxyfen. In their evaluation, Member States shall apply the provisions of Directive 98/8/EC, in particular the provisions of Article 5 as well as the common principles laid down in Annex VI.
For the implementation of the common principles of Annex VI, the content and conclusions of this assessment report, which is available at the Commission website[3], shall be taken into account.
However, where conclusions of this assessment report are based on data protected under the provisions of Directive 98/8/EC, such conclusions may not be used to the benefit of another applicant, unless access to these data has been granted.

1.3. Overall conclusion in the context of Directive 98/8/EC

The overall conclusion from the evaluation is that it may be expected that there are products containing Pyriproxyfen for the product-type 18, which will fulfil the requirements laid down in Article 5 of Directive 98/8/EC. This conclusion is however subject to:

i. compliance with the particular requirements in the following sections of this assessment report,

ii. the implementation of the provisions of Article 5(1) of Directive 98/8/EC, and

iii. the common principles laid down in Annex VI to Directive 98/8/EC.

Furthermore, these conclusions were reached within the framework of the uses that were proposed and supported by the applicant (see Appendix II). Extension of the use pattern beyond those described will require an evaluation at product authorisation level in order to establish whether the proposed extensions of use will satisfy the requirements of Article 5(1) and of the common principles laid down in Annex VI to Directive 98/8/EC.

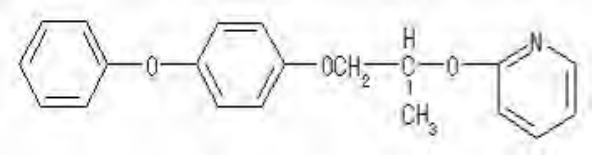
3 http://ec.europa.eu/comm/environment/biocides/index htm

2. OVERALL SUMMARY AND CONCLUSIONS

2.1. Presentation of the Active Substance

2.1.1. Identity, Physico-Chemical Properties & Methods of Analysis

Pyriproxyfen is a juvenile hormone mimic and insect growth regulator and is used to control a broad spectrum of insects. The active substance has the following structure:



The minimum purity of the active substance is 970 g/kg (sum of isomers; racemate).

Sumilarv® 0.5G is a granular (G) formulation containing 5.1 g/kg pure pyriproxyfen. It is proposed to be used in farm applications (animal houses) and waste treatment sites to control flies and for treatment of running and standing water to control mosquitoes.

Pyriproxyfen pure is a white granular solid with a melting range of 48 to 50°C, a boiling temperature of 318°C and a vapour pressure of <1.33 x 10-5 Pa at 23°C. Up to the boiling temperature no decomposition was observed under N2 atmosphere. Pyriproxyfen Technical is a pale yellowish to white solid. The (technical) substance is not highly flammable, has no self-ignition temperature below 400°C and has neither explosive properties nor oxidizing properties. Its water solubility at 20°C is 0.10 mg/L (pH 7). The log Pow is 4.86 (pH water phase 7). Pyriproxyfen is hydrolytically stable at pH 4, 7 and 9. The photolysis half-life under Xenon-light is 3.72-6.36 days at 25°C. Pyriproxyfen does not exhibit any particularly hazardous physical-chemical properties; it is therefore concluded that users are not considered to be at risk due to the physical-chemical properties of this active substance.

The biocidal product, Sumilarv ®0.5G (0.51 % w/w pure pyriproxyfen), is a pale yellow granular solid containing various co-formulants. Based on the composition of the product it is considered unlikely to be flammable or to have explosive or oxidising properties. Stability was confirmed in an accelerated storage stability test (14 days at 54°C) and in a shelf-life study of 6 months (interim results) at 25°C, although applicability of the product packaging used could not be checked. The assessment did not reveal any physico-chemical properties which could adversely affect the use of the product. An evaluation of the safety data sheets of all ingredients in Sumilarv ®0.5G did not indicate a risk due their physical-chemical properties. In conclusion, users are not considered to be at risk due to the physical-chemical properties of the formulated product.

A HPLC-UV method was submitted for the determination of pyriproxyfen in technical material. The identity of pyriproxyfen in technical material was confirmed using HPLC-MS.
One method (BBA multi method L 00.00-34, GC-NPD) was submitted for the determination of pyriproxyfen residues in soil and found acceptable (LOQ 0.01 mg/kg).
A GC-NPD method was submitted for the determination of pyriproxyfen in tap water and surface water and deemed acceptable (LOQ tap water: 0.1 µg/L; LOQ surface water 0.01 µg/L).

One method (GC-NPD) was submitted for the determination of pyriproxyfen in air.
Confirmation was by GC-MS. The method was accepted with an LOQ of 1.0 µg/m3.
An acceptable GC-FID method was submitted for the determination of pyriproxyfen in the biocidal product Sumilarv® 0.5G.
All analytical methods were sufficiently validated.

2.1.2. Intended Uses and Efficacy

The assessment of the biocidal activity of the active substance demonstrates that it has a sufficient level of efficacy against the target organism(s) and the evaluation of the summary data provided in support of the efficacy of the accompanying product, establishes that the product may be expected to be efficacious.

Pyriproxyfen is a racemic mixture of 2 stereoisomers in approximately proportions of 1:1. The stereoisomers are both effective against insects. Efficacy trials results using optical isomers showed that activities ratio of the R-isomer vs. the S-isomer was approximately 1 : 9 (R : S) with the S-isomer being the more active of the two isomers.

In addition, in order to facilitate the work of Member States in granting or reviewing authorisations, and to apply adequately the provisions of Article 5(1) of Directive 98/8/EC and the common principles laid down in Annex VI of that Directive, the intended uses of the substance, as identified during the evaluation process, are listed in Appendix II.

Pyriproxyfen is an insecticide used for the management of flies and mosquitoes (Product Type 18 of Directive 98/8/EC). Pyriproxyfen is an insect growth regulator and acts as a juvenile hormone mimic, interrupting the insect morphogenesis. It prevents (depending upon the time of application) egg hatching, metamorphosis of larvae into pupae, and pupae into adult.
The notifier proposed that Sumilarv® 0.5G is to be used by professionals to control flies in farm applications such as cattle pens, pig houses and poultry houses, and in waste treatment facilities (i.e. municipal waste tips), and to control mosquitoes in both running and standing water. Insufficient information was provided to support the proposed use for the control of mosquitoes in running water. When used in animal houses (in pig and cattle houses but not for poultry houses) an effect on the emergence of adult flies was proven, although, the results were inconclusive regarding the effect on number of free-flying houseflies. Efficacy data were provided and accepted in support of the use in waste treatment facilities against flies, provided that the product is applied on compacted waste. The submitted data also supported the use for the control of *C. pipiens* and *A. togoi* (but not other mosquito species) in shallow standing water (but not in deep water) at doses of 0.05-0.1 mg/L (i.e. higher than the proposed dose of 0.01-0.05 mg a.s./L). When authorisations are requested at a national level, the EU member state concerned should verify that the efficacy is supported by acceptable data. It should be noted that the risk assessment below is based on the intended uses as proposed by the notifier. Any amendments of the use instructions may affect the outcome of the assessments.

2.1.3. Classification and Labelling

Physical-chemical properties
No classification is considered necessary for pyriproxyfen and Sumilarv® 0.5G based on both 1999/45/EC (product) and Reg (EC) 1272/2008 (pyriproxyfen and product respectively) .

Human toxicology
Based on the available toxicological data of pyriproxyfen no classification or labelling is proposed for the active substance.
Based on the available toxicological data of Sumilarv® 0.5G no classification or labelling is proposed for the biocidal product.

Based on the occupational risk assessment of Sumilarv® 0.5G, S36 (Wear suitable protective clothing) and S37 (Wear suitable gloves) (according to Directive 67/548/EC) or P280c (Wear suitable protective clothing and gloves, according to Regulation 1272/2008/EC) should be included on the product label.

Environment
Based on the available environmental data pyriproxyfen should be classified with N "dangerous to the environment", R50 "Very toxic to aquatic organisms" and R53 "May cause long-term adverse effects in the environment". Pyriproxyfen was adopted in Annex I to Dir. 67/548/EC at ATP 31 (index No.613-303-00-3) with the official classification N;R50-53.
Based on these risk phrases, the safety phrases S60 "This material and its container must be disposed of as hazardous waste" and S61 "Avoid release to the environment are applicable. Refer to special instructions/Safety data sheets" are proposed.

According to Annex VI to regulation (EC) 1272/2008 pyriproxyfen is classified as Aquatic Acute 1 (H400) and Aquatic Chronic 1 (H410), the hazard statement for labelling is H410 with pictogram GHS09 and signal word code ''Wng''.
The precautionary statements P273 ''Avoid release to the environment'', P391 ''Collect spillage'' and P501 ''Dispose of contents/container…(in accordance with local/regional/national/international regulation (to be specified)'' are proposed.

Sumilarv® 0.5G should be classified with N "dangerous to the environment", R51 "Toxic to aquatic organisms" and R53 "May cause long term adverse effects in the aquatic environment". Based on these risk phrases, the safety phrase S61 "Avoid release to the environment. Refer to special instructions/Safety data sheets" is proposed.

According to Annex VI to regulation (EC) 1272/2008 Sumilarv® 0.5G is classified as Aquatic Chronic 2 (H411), the hazard statement for labelling is H411 with pictogram GHS09 and no signal word.
The precautionary statements P273 ''Avoid release to the environment'', P391 ''Collect spillage'' and P501 ''Dispose of contents/container…(in accordance with local/regional/national/international regulation (to be specified)'' are proposed.

2.2. Summary of the Risk Assessment

2.2.1. Human Health Risk Assessment

2.2.1.1. Hazard identification of the active substance

Toxicokinetics

In rats pyriproxyfen is orally absorbed for approximately 40-50%, eliminated mainly via faeces (81-93%) and urine (5-13%). Excretion is rapid (up to 50% AR within 24 hours after a single dose, up to 60% AR within 24 hours after repeated dose). The main metabolic route is hydroxylation at the 4-position followed by a further hydroxylation step and conjugation. Maximum radioactivity in faeces, urine, blood and tissues was found after 4-8 hours after administration (as the parent or metabolised) with the exception of fat. Metabolism in females is somewhat slower than in males. Peak levels in males are higher than in females. In mice elimination via urine is higher (10-37% AR) than in rats. Metabolism in mice seems to be very similar to that in rats. Oral absorption amounts to 39-49% AR in males and females based on the amount of radiolabel found in bile, urine, tissues, cage wash and carcass. For risk assessment purposes, 40% oral absorption is taken as a worst-case estimate.
Based on the physical chemical properties of pyriproxyfen (Mw 321, log Pow 4.86), a dermal absorption of 100% should be assumed for risk assessment purposes. However, an in vitro dermal absorption study with an EC formulation is available, for which a dermal absorption of 13% is concluded for the spray dilution. However, Sumilarv® 0.5G is a granule, and dry particulates will be absorbed less readily than liquids. Dry particulates will have to dissolve into the surface moisture before absorption can occur. Considering the low water solubility of pyriproxyfen (0.1 mg/L), the dermal absorption is considered to be limited. Despite the differences between the granule formulation and the EC formulation, it can be concluded that the dermal absorption of Sumilarv® 0.5G will not be higher than the dermal absorption of the EC formulation. Therefore, for risk assessment purposes a dermal absorption of 13% will be assumed as a worst-case estimate.
In absence of data, a default of 100% (worst-case) for inhalation absorption will be used for risk assessment purposes.

Acute toxicity
Pyriproxyfen does not need to be classified on the basis of its oral, dermal and respiratory toxicity in rats. Pyriproxyfen is considered not irritating to the skin and the eyes according to the criteria given in Annex IV of Directive 2001/59/EC. Pyriproxyfen has no skin sensitizing properties in a Maximisation test.

Repeated dose toxicity
In the subacute studies preliminary indications of liver injury (hypertrophy) were observed and in the semichronic studies marked liver injury was observed, leading to hepatocellular injury, hepatobiliary effects, cholestasis in rat and dog and secondary renal failure in the rat. In addition, in all rodent studies with oral exposure and dog studies, slight changes in haematological parameters were observed.
The lowest NOAEL in semichronic studies was established in 52-week oral (capsule) toxicity studies in dogs. A NOAEL of 10 mg/kg bw/day was established, based on increased liver weights and increased cholesterol levels at 30 and 100 mg/kg bw/day.
In a 13-week oral toxicity study in rats, a NOAEL of 400 mg/kg food (equal to 23 mg/kg bw/day in males and 28 mg/kg bw/day in females), based on changes in haematology, increased liver weight and histopathological changes in the liver. In a 6 month study in rats, a NOAEL of 400 mg/kg food (equal to 24 mg/kg bw/day in males and 28 mg/kg bw/day in females), was established based on increased cholesterol and phospholipids, decreased globulin β, changes in haematology (RBC, HB and HCT) and increased liver weights in males at 2000 mg/kg food.
Repeated dermal and inhalation studies were also conducted. In a 28-day dermal toxicity study in rats, the NOAEL for both local and systemic effects is set at 1000 mg/kg bw/day, based on

the absence of local and systemic effects. In a 28-day inhalation study in rats, the NOAEL for systemic effects was established at 482 mg/m^3, based on salivation, reduced body weight gain in males, increased LDH, and changes in organ weights in males (lung, spleen and liver due to changes in body weight) at 1000 mg/m^3.

Genotoxicity
Pyriproxyfen is considered to be non-genotoxic.

Chronic toxicity and carcinogenicity
In a chronic toxicity and carcinogenicity study in rats, a NOAEL of 27 mg/kg bw/day was established, based on changes in clinical biochemistry, increased liver weight and histopathological changes in the liver. There was no evidence of a carcinogenic potential of pyriproxyfen in rats.
In a carcinogenicity study in mice, a NOAEL of 16.4 mg/kg bw/day was established, based on a reduced survival rate, increased liver weight, increased severity of systemic amyloidosis and histopathological changes in kidneys. There was no evidence of a carcinogenic potential of pyriproxyfen in mice.

Teratogenicity and fertility
Developmental toxicity was studied in the rats and rabbits. In both species no irreversible structural effects were observed. In a teratogenicity study in rats, a NOAEL for maternal toxicity was established at 100 mg/kg bw/day, based on decreased body weight gain and food consumption, increased water consumption, and clinical signs of toxicity. For developmental toxicity a NOAEL of 100 mg/kg bw/day is established based on an increased number of foetuses with an opening of the foramen transversarium of the 7th cervical vertebrae. In a teratogenicity study in rabbits, a NOAEL for maternal toxicity was established at 100 mg/kg bw/day, based on abortion and premature delivery. No developmental toxicity was observed at doses up to 300 mg/kg bw/day.
In a two-generation reproduction study in rats, the NOAEL for parental toxicity was set at 13.3 mg/kg bw/day (200 mg/kg food), based on increased relative liver weights in F1 parental males. For developmental toxicity a NOAEL of 66.7 mg/kg bw/day (1000 mg/kg food) was established, based on reduced F1 and F2 pup weights. No fertility effects were observed at doses up to 5000 mg/kg food (333 mg/kg bw/day).

Neurotoxicity
Clinical observations, FOB and pathology results from the subacute and semichronic toxicity studies with rats, mice and dogs, gave no indications for neurotoxicity of pyriproxyfen. Submission of neurotoxicity data on pyriproxyfen is not considered necessary.

2.2.1.2. Hazard identification of the biocidal product

Sumilarv ® 0.5G needs no classification for acute oral and dermal toxicity. Sumilarv® 0.5G needs no classification for skin and eye irritation. Sumilarv® 0.5G showed no skin sensitisation in a Buehler test in guinea pigs.

2.2.1.3. Effects assessment

Sumilarv® 0.5G is intended for professional use only. Based on the use frequency and the use season (at least spring until autumn), it cannot be excluded that the exposure period will exceed three months. Based on above considerations an AEL or MOE for chronic exposure should be derived.

Overall NOAEL

To determine the starting point for the derivation of the semi-chronic/chronic AEL, a comparison of NOAELs and LOAELs of the semichronic and reproduction toxicity studies was made. Based on this comparison the NOAEL of 13.3 mg/kg bw/day from the 2-generation study or the NOAEL of 10 mg/kg bw/day from the 1-year study in dogs should be considered the most suitable NOAELs for the derivation of the AEL. The NOAELs from the 13-weeks and 6-months studies (23.5 and 24.0 mg/kg bw/day, respectively) in rats were considered to be too close to the LOAEL of 30 mg/kg bw/day from the 1-year oral toxicity study in dogs). However, although no effect exposure duration was observed in rats, as no chronic study in dogs was available, it was decided to select the overall NOAEL of 10 mg/kg bw/day for the derivation of the semi-chronic/chronic AEL.

For completeness (although not used in the risk assessment), an short-term AEL is derived. To dertermine the starting point for the derivation of the acute AEL, a comparison of NOAELs and LOAELs of the subacute studies was made. Based on this comparison the NOAELs of 29 mg/kg bw/day from the 28-day in rats is considered the most suitable NOAEL for the derivation of the short-term AEL.

Assessment factor

The available information on toxicokinetics and –dynamics of pyriproxyfen does not allow refinement of the standard assessment factors (10 for interspecies variation and 10 for intraspecies variation).

Considering the effect levels in subacute, semichronic and chronic oral toxicity studies in rats, dogs and mice, there seems to be no effect of exposure duration after oral administration of pyriproxyfen. Therefore, the application of an additional assessment factor for extrapolation for exposure duration is not required for the derivation of the semi-chronic/chronic AEL derivation.

AEL (Acceptable Operator Exposure Level) and AEL (Acceptable Exposure Level)

The AEL for semi-chronic/chronic systemic exposure is set on the basis of the overall NOAEL of 10 mg/kg bw/day from the 1-year oral toxicity study in dogs. Application of a safety factor of 100 for intra- and interspecies differences, results in an external semi-chronic/chronic AEL of 0.1 mg/kg bw/day. As oral absorption is assumed to be 40%, correction is made for oral absorption, resulting in a semi-chronic/chronic systemic AEL of 0.04 mg/kg bw/day, for both the professional user and the general population.

Using the NOAEL of 29 mg/kg bw/day from a 28-day oral toxicity study in rat and a safety safety factor of 100 for intra- and interspecies differences, including a correction for oral absorption (40%), results in a systemic acute AEL of 0.12 mg/kg bw/day.

Derivation of acceptable MOE (margin of exposure)

Based on the hazard profile of pyriproxyfen and considering its use pattern, for professional users and the general population an MOE of 100 would be considered acceptable, on the basis of the standard assessment factors of 10 x 10 for interspecies and intraspecies variability.

2.2.1.4. Exposure assessment

Professional users
The product is intended for professional use only. This will include pest controllers who may potentially apply the product daily and farmers who may only use the product intermittently for control of flies within their livestock buildings. The product may be applied manually where small amounts are required or using machinery for larger areas. During application other people than the operator can be present at the treated location however exposure of bystanders during application is considered negligible due to the granular nature of the product.

Exposure calculations during loading and application have been performed using scenarios from the US EPA model PHED (PHED Surrogate Exposure Guide, Estimates of Worker Exposure from the Pesticide Handler Database, Version 1.1, August 1998) as these more closely represent use scenarios than models recommended in the TNsG – Human Exposure to Biocidal Products (as revised in the User Guidance Version 1, June 2002).

Indirect (secondary) exposure
Secondary (indirect) exposure following animal house or waste tip treatment is very unlikely but exposure to treated standing water via swimming is possible and there will also be exposure during the laundering of contaminated clothing. In addition, secondary exposure through consumption of edible parts, milk and eggs of livestock was considered, when Sumilarv® 0.5G is used in water and animal houses.
Since the TNsG does not include a model for exposure during swimming, a model used by the US EPA has been used (TNsG refers however to the EPA SOPs for residential exposure scenarios). For laundering, the models for user exposure have been used. In addition, quantitative assessments were made of exposure of livestock to Sumilarv® 0.5G and of consumption of treated water by livestock.

2.2.1.5. Risk characterisation

For the unprotected professional user, adverse health effects cannot be excluded due to combined dermal and respiratory exposure to pyriproxyfen, as a result of manual application of Sumilarv® 0.5G. For manual application by hand, a single layer of clothing and gloves will reduce the dermal exposure. For manual application by hand granule spreader, a single layer of clothing (no gloves) will reduce the dermal exposure. For manual application by blower with granule nozzle, coverall over a single layer of clothing and with gloves will reduce the dermal exposure. Correct use of this personal protection equipment will result in sufficient reduction of the exposure to pyriproxyfen for the manual application of Sumilarv® 0.5G.

Based on the risk assessment it can be concluded that no adverse health effects are expected for the unprotected professional user after the combined dermal and respiratory exposure to pyriproxyfen as a result of the mechanical application of Sumilarv® 0.5G.

Based on the risk assessment it can be concluded that no adverse health effects are expected for the general population after indirect exposure to pyriproxyfen as a result of the use of Sumilarv® 0.5G.

During the evaluation process, the concentration of the representative product changed from 0.5% to 0.525%. However, this change will not result in a different conclusion for the risk assessment. Therefore, it was decided that the presented calculations (using the 0.5% value) are sufficient to assess the risk for the representative product.

2.2.2. Environmental Risk Assessment

2.2.2.1. Fate and distribution in the environment

Pyriproxyfen is classified as “not ready biodegradable”. In water/sediment systems, pyriproxyfen degraded with a geomean total system half-life of 6.5 days (20°C). CO_2 was a major degradation product (up to 53% AR after 100 days) and bound residues after 100 days were maximum 51% AR. The main metabolites (>10% AR) of pyriproxyfen in (combined) water/sediment were 4’-OH-pyriproxyfen, PYPAC and DPH-Pyr. Pyriproxyfen degraded slowly (total system DT_{50} of 554 days at 25°C) under anaerobic conditions.

In soil, pyriproxyfen degraded under aerobic conditions with a geomean half-life of 7.8 days (20°C). CO_2 was a major degradation product (up to 61% AR after 90 days) and bound residues after 92-122 days were maximum 58% AR. No soil metabolites above 10% AR were observed. Metabolites 4’-OH-Pyr and PYPAC exceeded 5% AR at two consecutive time points in soil degradation studies.

Abiotic degradation of pyriproxyfen through hydrolysis is not likely to occur as pyriproxyfen was found to be stable in aqueous solutions at pH 4, 7 and 9. Pyriproxyfen is susceptible to photolysis in aquatic environments (quantum yield 0.08661) and on soil surfaces, however no specific photolytic metabolites are expected to occur under environmental conditions.

Soil-water Koc values for pyriproxyfen ranged from 11000 to 34200 L/kg indicating strong adsorption of pyriproxyfen on soil and a low mobility. For 4’-OH-pyriproxyfen, Koc values were 921-3811 L/kg and for PYPAC 9-32 L/kg. Distribution of pyriproxyfen and metabolites 4’-OH-pyriproxyfen, PYPAC and DPH-Pyr to air is considered insignificant due to their rapid oxidative degradation in air and/or low volatility.

2.2.2.2. Effects assessment

Aquatic compartment

Freshwater

Acute and long-term tests are available with freshwater organisms. The most sensitive species is Aedes aegypti with a NOEC mortality of 1.5 ng/L. Applying an assessment factor of 10 leads to a PNECaquatic of 0.15 ng/L. However, Aedes aegypti is considered a target insect species and at TM08III it was concluded that “in principle ecotoxicological data cannot be substituted with results from efficacy tests due to the specific design of these tests". Nevertheless efficacy data with Aedes aegypti and other target insects indicate that probably also pelagic non-target insects, are more sensitive than crustaceans such as Daphnia magna and this must be taken into account in the extrapolation factor used for deriving the PNEC.

In the base-set for freshwater toxicity data for algae, crustaceans, and fish, the lowest NOEC is 15 ng a.s./L for Daphnia magna. Data from field tests and the Chironomus riparius water-sediment test indicate that pyriproxyfen has a similar toxicity to both insects and crustaceans. In these field studies many species are taken into account of which crustaceans are belonging to the most sensitive organisms. For this reason the interspecies variation is sufficiently covered and supports the use of a lower assessment factor of 5. Applying a default assessment factor of 5 to the lowest NOEC (15 ng/L) for Daphnia magna leads to PNEC of 15 ng a.s./l / 5 = 3 ng a.s./l,

To assess the risk for short term release (one application) it is considered acceptable to use the results from higher Tier tests for PNEC derivation. In this case the lowest $NOEC_{community}$ of 5 µg/L is applicable, with an assessment factor of 5 this leads to a $PNEC_{aquatic}$ = 5 µg a.s./L / 5. $PNEC_{aquatic\text{-}single\ application}$ = 1 µg/L.
This $PNEC_{aquatic}$ is considered relevant for one time application to surface water

Acute toxicity data are available for all three trophic levels in the aquatic food chain. Consequently the assessment factor of 1000 is applied to the lowest $L(E)C_{50}$ available for relevant metabolites 4'-OH-pyriproxyfen, DPY-PYR and PYPAC.

Species	Effect parameter	Pyriproxyfen	4'-OH-Pyriproxyfen	DPH pyr	PYPAC
Daphnia magna	48 h EC_{50} (mg a.s./L)	0.40	1.8	>9.8[1]	>95[1]
Pseudokirchneriella subcapita	72 h E_rC_{50} (mg a.s./L)	0.15	> 2.5[1]	>9.5[1]	**30**[1]
Oncorhynchus mykiss	96 h LC_{50} (mg a.s./L)	>0.27	**0.27**[1]	**5.1**[1]	>93[1]

[1] Based on mean measured concentrations

The resulting PNEC values are 0.27, 5.1 and 30 µg/L for 4'-OH-pyriproxyfen, DPH pyr and PYPAC, respectively.

Sediment
A long term test with a sediment dwelling organism is available. Results from a chronic toxicity test with Chironomus riparius in a water spiked water-sediment test a TWA NOEC of 2.2 µg/L was derived. Applying an assessment factor of 100, the PNECsed for pyriproxyfen is 0.022 µg a.s./L.
As this test is a water spiked study, next to the PNEC above also the PNEC on basis of equilibrium partitioning is calculated. The resulting **$PNEC_{sed,EP}$ is 1.4 µg a.s./kg sediment (ww)** or 6.44 µg a.s./kg sediment (dw)

Based on a $PNEC_{aquatic}$ of 0.27 µg a.s./L, the $PNEC_{sed,EP}$ for 4'-OH-pyriproxyfen is 0.015 mg a.s./ww or 0.07 µg a.s./kg dw sediment (calculated according to the equilibrium partitioning method).

Marine environment
A risk assessment for the marine environment is not made.

Sewage treatment plants
Based on a NOEC of 100 mg a.s./L and an assessment factor of 10, **the PNECmicroorganisms STP is 10 mg a.s./L**. Additionally a PNECmicro-organisms STP of 0.101 mg a.s./L was derived on basis of the maximum solubility. The RMS prefers to use the PNEC on basis of the NOEC micro-organisms, considering that exposure of microorganisms will be both from the soluble and adsorbed fraction. As there is no consensus as to what PNEC to use for the risk assessment, both values are included.

Air compartment

No toxicity data for air were available. Therefore, a PNECair was not calculated.

Terrestrial compartment

Acute terrestrial toxicity studies are available with microorganisms, earthworms and plants. The lowest NOEC of ≥1.5 mg/kg dw is derived for soil microorganisms.

Pyriproxyfen is an insecticide with a specific mode of action, however, soil ecotoxicity tests with non-target soil insects are missing, indicating that the PNEC could be underestimated. Because of the uncertainty with respect to the experimental data, the PNECsoil is calculated from the PNECaquatic of 3 ng a.s./L, applying equilibrium partitioning according to the TGD. **the PNECsoil,EP is 1.1 µg a.s./kg ww soil** or 1.3 µg a.s./kg dw soil.

Other terrestrial non-target organisms
Exposure of bees and other beneficial arthropods is considered insignificant. Therefore, a PNECadd,terrestrial was not calculated.

Terrestrial vertebrates
The toxicity towards birds and mammals is low with LD50 values of >1906 and >5000 mg/kg bw, respectively (0% mortality). The lowest long term NOEC for mammals is 200 mg a.s./kg diet and an assessment factor of 30, the PNECoral is 6.7 mg a.s./kg diet (0.44 mg a.s./kg bw).

Based on a 21 weeks NOECreproduction of 572 mg a.s./kg diet and an assessment factor of 30, the PNECoral,birds is 19 mg a.s./kg diet (2.3 mg a.s./kg bw).

2.2.2.3. PBT, POPs and ED assessment

P-assessment
In water/sediment studies, pyriproxyfen dissipated from the water column with a geometric mean DT50 of 1.5 days at 20°C (corresponding to 2.8 days at 12°C), hence <40 days. Pyriproxyfen and its metabolites DPH pyriproxyfen, PYPAC and 4'-OH-Pyr do not meet the criterion for persistence in water.
The geometric mean DT50 for degradation of pyriproxyfen in sediment was 34.0 days at 20°C (corresponding to 64.5 days at 12°C), hence <120 days. Pyriproxyfen and its metabolites PYPAC and 4'-OH-Pyr do not meet the criterion for persistence in sediment. With a geometric mean DT50 value of 124.4 d (12°C) in sediment the metabolite DPH pyriproxyfen meets the criterion for persistence in sediment. However, DPH pyriproxyfen did not exceed the 10% formation limit in sediment and was only detected in water once > 10% formation. Therefore

DPH pyriproxyfen is not considered a major metabolite for sediment. It is concluded that pyriproxyfen nor its metabolites are persistent and do not meet the criterion for persistence in water nor sediment.

Table 2.2.2.3-1 Degradation half lives in water and sediment systems

	Guideline/ test method	Degradation	
		Incubation period	Degree [%] or half life [days]
Pyriproxyfen	OECD 301C Modified MITI	28 days	**<1%**
Pyriproxyfen	EPA 162-3 anaerobic biodeg 25°C (12 °C)	DT50 water DT50 sediment DT50 total	<1 d (<3 d) **196 d (555 d)** **554 d (1567 d)**
Pyriproxyfen	SETAC (1995) water sediment 20°C (12 °C)	DT50 water DT50 sediment DT50 total	1.5 d (2.8 d) 34.0 d (64.5 d) 6.5 d (12.3 d)
DPH pyriproxyfen	SETAC (1995) water sediment 20°C (12 °C)	DT50 water DT50 sediment DT50 total	<4 d (< 7.6 d) 65.6 d (124.4 d) <4 d (< 7.6 d)
PYPAC	SETAC (1995) water sediment 20°C (12 °C)	DT50 water DT50 sediment DT50 total	17.6 d (33.4 d) 25.5 d (48.4 d) 27.0 d (51.2 d)
4'-OH-Pyr	SETAC (1995) water sediment 20°C (12 °C)	DT50 water DT50 sediment DT50 total	0.5 d (0.9 d) 24.9 d (47.2 d) 3.1 d (5.9 d)

The REACH guidance is not fully clear as to whether both aerobic and anaerobic degradation tests should be considered in the assessment of persistence. The criteria in table R.11-1 do not refer to anaerobic degradation and Figure R.11-1 specifically refers to "OECD 308/309 aerobic only" for the persistency assessment. Although the REACH guidance references the OECD 308/309 guidance, which includes guidance for aerobic and anaerobic water sediment studies, the anaerobic part is rarely performed unless there is a specific need, such as exposure to anaerobic digester, or where release to animal manure storage facilities is possible. For pyriproxyfen this may be considered to be relevant due to the used in animal housing, however once manure is applied to land aerobic conditions are resumed. The anaerobic water/sediment degradation was not considered as being comparable to manure storage, and an assumption of no degradation in the manure was used in the in the calculation of PEC. It was agreed that refinement of the PEC to include degradation in the manure during storage would require a specific study with manure, however there is no guidance for such studies. The EPA anaerobic water-sediment was included in the dossier to address the degradation in anaerobic soil data requirement, as the design of the study closely resembles the relevant test conditions but with sediment instead of soil. The water-sediment testing requirement is more of a higher tier study

to determine fate in natural water bodies, where full anaerobic conditions rarely occur and is obviously more relevant to the question of persistence in the environment.

In soil studies, pyriproxyfen transformed with a mean DT50 of 10 days at 20oC (corresponding to 19 days at 12°C), hence <120 days. Mean degradation half lives of 4'-OH-pyriproxyfen and PYPAC are 38 days and 19.5 days at 20°C (corresponding to 72.1 days for of 4'-OH-pyriproxyfen and 37.0 days for PYPAC at 12°C), respectively. Therefore, pyriproxyfen and its metabolites do not meet the criterion for persistence in soil.

Table 2.2.2.3-2 Degradation half lives in soil systems

		pyriproxyfen		**4'-OH-pyriproxyfen**		**PYPAC**	
Guideline/ test method	**Soil**	**DT50 (25°C, days)**	**DT50 (20°C, days)**	**DT50 (25°C days)**	**DT50 (20°C, (days)**	**DT50 (25°C, (days)**	**DT50 20°C, days)**
US EPA Subdivision N, Section 162-1	Sandy Loam	8.3	12	47	70(**)	25	37
	Sandy Loam	8.3	12	28	28(**)	14	21
	Mean(*)	8.3	12				
US EPA Subdivision N, Section 162-1	Sandy Clay Loam	16	24	24	24(**)	0.4	0.4
	Sandy Clay Loam	17	25	30	30(**)	13	
	Mean(*)	17	25				
US EPA Subdivision N, Section 162-1	Sandy Loam	6.3	9.4	32			
	Sandy Loam	13	19				
	Mean(*)	9.7	14				
SETAC (1995)	Sandy Loam	4.4	4.4				
	Sandy Loam	6.1	6.1				
	Silt Loam	3.7	3.7				
	Clay Loam	2.8	2.8				
US EPA Subdivision N, Section 163-1	Sandy Loam(**)	7.1	10.5(**)				
	Sandy Loam(**)	9.4	13.9(**)				
	Mean(*)	8.3	12				
Overall mean			10		38.0		19.5
Overall geomean			7.8		34.5		6.8

* = Mean values from two experiments with pyridyl- and phenyl-labelled pyriproxyfen
** = Results from the aged residue column leaching study

B-assessment
Since the worst-case measured BCF is 1495 L/kg wet weight for radioactivity, hence <2000, pyriproxyfen also does not meet the B criterion.

PBT conclusion
Pyriproxyfen fulfils the T criterion (NOEC 15 ng a.s./L, hence <0.01 mg/L). But, pyriproxyfen does not meet the PBT nor the vPvB criteria. Inclusion in Annex I is not restricted by these data.

POPs criteria are not met considering a calculated half-life in air of 3.8 hours (criterion is half-life >2 days), based on reaction with hydroxyl radicals ($9.7x10^5$ OH/cm^3; 24^{-h} day time), indicating that the criterion for long-range transport potential is not fulfilled. Inclusion in Annex I is not restricted by these data.

As to endocrine disruption identification: Pyriproxyfen is not included in the Commission staff working document on implementation of the Community Strategy for Endocrine Disrupters - a range of substances suspected of interfering with the hormone systems of humans and wildlife (COM (1999) 706)). Although the mode of action of Pyriproxyfen is as "a juvenile hormone mimic and insect growth regulator", there is no evidence of any endocrine disruption potential in the human health or ecotoxicological studies presented in the dossier.

2.2.2.4. Exposure assessment

For the life cycle stages "production and formulation of the biocidal product" no environmental risk characterisation has been performed as the active substance is produced outside of the EU. The application phase is considered relevant for the direct use of Sumilarv 0.5G in running and standing water, which will lead to exposure of surface water, sediment and soil.

The application and in-service phase for use on waste treatment sites potentially may result in emission to surface water, soil and ground water at or next to the site due to drift.

In the waste stage soil, surface water, sediment and groundwater compartments may be exposed following the use of Sumilarv 0.5G in animal housing through spreading of treated manure on the land. STPs and subsequently surface water may also be exposed by discharge of wastewater following cleaning operations in animal housing (The ESD only considers specified poultry housing as relevant for this emission route).

Exposure of the air compartment is unlikely because of the rapid oxidative degradation in air and/or low volatility of pyriproxyfen and metabolites.

PEC/PNEC ratios for pyriproxyfen and relevant metabolites for the soil and water compartments are given under 2.2.2.5. PEC values were calculated according to the guidance provided in OECD emission scenario document 14. FOCUS models were used for $PEC_{groundwater}$, PEC_{SW} and PEC_{SED} calculations (in line with OECD ESD 14).

Air compartment

Based on a vapour pressure of $<1.33 \times 10^{-5}$ Pa at 22.81°C, a calculated Henry's law constant for pyriproxyfen of $<4.23 \times 10^{-2}$ Pa m3 mol-1 at 20-23°C and a DT50 of 3.8 hours for photochemical oxidative degradation, concentrations of pyriproxyfen in air are expected to be negligible.

Based on an estimated vapour pressure of 0.0777 Pa at 25°C, an estimated Henry's law constant of 2.0 x 10^{-4} Pa m3 mol^{-1} at 25°C and a DT50 of 0.6 days for photochemical oxidative degradation, concentrations of PYPAC in air are expected to be negligible.
Based on an estimated vapour pressure of 1.05 x 10^{-7} Pa for 4'-OH-pyriproxyfen and 1.77 x 10^{-4} Pa for DPH-PYR, these metabolites are not expected to occur in air.

Non compartment specific exposure relevant to the food chain (secondary poisoning)

Aquatic food chain
The measured BCF is <2000 and the BMF is 1. The PECoral,predator values are 0.10 mg a.s./kg food for the application of treated manure to grassland (Maximum concentration derived from the worst case scenario, Focus step2 calculation) and 75 mg a.s./kg food for direct application to surface water (Predicted initial concentration).

Terrestrial food chain
For Csoil (PECsoil), the maximum PECsoil, i.e. that for turkeys in free range with litter floor (grassland), is used. The resulting PECoral,predator is 0.50 mg a.s./kg food for the application of treated manure to grassland.

The application of pyriproxyfen on waste treatment sites does not result in exposure of the aquatic and terrestrial compartments, and hence, secondary poisoning is not relevant for this application.

2.2.2.5. Risk characterisation for the environment

Aquatic compartment

Sewage treatment plants
A risk for micro-organisms in the STP is not expected (PEC/PNEC 0.0005, hence <1).

Surface water
For the direct application of pyriproxyfen to surface water, the PEC/PNEC ratios for pyriproxyfen and 4'-OH-pyriproxyfen are >1, a risk to aquatic organisms is identified and no unacceptable risks for the metabolites DPH-PYR and PYPAC.
The application of pyriproxyfen in poultry housing with release via the STP to surface water results in a risk for aquatic organisms of pyriproxyfen, as is indicated by PEC/PNEC ratios >1 for both worst case and best case scenarios. No unacceptable risk was identified for metabolites DPH-PYR, 4'-OH-pyriproxyfen and PYPAC.
No risk for aquatic organisms from indirect emissions via the STP is expected for use in cattle and pig animal housings, since for these animal categories emission from stables discharging via the sewer and STP to surface water is not considered relevant.
In the first Tier assessment the application of treated manure with exposure of surface water via run off, in the best case scenario and thus in all scenarios the pyriproxyfen PEC/PNEC ratios are >1. In the higher Tier assessment, however, the risk to aquatic organisms can be considered acceptable as for the majority of the surface water scenarios. In the product authorisation phase Member States must check whether all relevant surface water scenarios are covered for their specific circumstances.

For the metabolites DPH-PYR, 4'-OH-pyriproxyfen and PYPAC the PEC/PNEC ratios for exposure of surface water after application of manure to agricultural soil are <1.

Due to the proposed mode of application (blower with granule nozzle or crawler mount type power granular feeder), emission to surface water surrounding the waste treatment facilities may occur when the edges of waste treatment facilities are treated. In principle for the use on waste facilities emission to the environment can be prevented. The following emission reduction measures are possible:

- Prevent adverse effects in the environment due to drift of the biocidal product;
- Only apply the product in a blower facing the nozzle inwards in the direction of the waste facility;
- Only apply the product at wind speed 0, 1 or 2 beaufort;
- Application of the biocidal product at waste deposit facilities is only acceptable if the facility does not border to surface water.

In the context of product authorisation the Member States should assess whether these mitigation measures are sufficient to prevent drift for specific situations resulting from the application with e.g. a crawler mount type power granular feeder.
Potential leaching to groundwater is regulated in the Directive 1999/31/EC. Measures to prevent pollution include technical standards and monitoring procedures. The required measures enforce to minimalise environmental exposure to the appropriate standard required for discharge and hence, the risk to the aquatic compartment is acceptable for this use.

Sediment
The risk assessment of sediment is carried out for the parent and 4'-OH-pyriproxyfen (the only metabolite >10% of the applied active substance).
For the direct application to surface water, the PEC/PNEC ratios for pyriproxyfen and 4'-OH-pyriproxyfen are >1, and a risk to sediment-dwelling organisms is identified.

The application of pyriproxyfen in poultry housings with release via the STP to sediment results in a risk for sediment-dwelling organisms for pyriproxyfen, as is indicated by a PEC/PNEC ratios >1 for both worst case and best case scenarios. An unacceptable risk for the metabolite 4'OH-pyriproxyfen was identified for the worst-case scenario only.
For the first Tier assessment, the application of treated manure with exposure of sediment via run off to surface water, in the best case scenario and thus in all scenarios the pyriproxyfen PEC/PNEC ratios are >1. In the higher Tier assessment, however, the risk to sediment organisms can be considered acceptable as for the majority of the surface water scenarios. in FOCUS STEP 3 no risk (PEC/PNEC ratio < 1) was identified for both the worst and the best case scenarios and thus the risk for sediment organisms is acceptable.
In the product authorisation phase Member States must check whether all relevant surface water scenarios are covered for their specific circumstances.
For the metabolite 4'-OH-pyriproxyfen the PEC/PNEC ratios for exposure of surface water after application of manure to agricultural soil are <1.

Due to the proposed mode of application (blower with granule nozzle or crawler mount type power granular feeder), emission to surface water surrounding the waste treatment facilities may occur when the edges of waste treatment facilities are treated. Exposure reduction measures are possible, e.g. apply inwards from the edges of the waste treatment facilities. It should be noted that contamination of the surrounding environment as a consequence of drift

resulting from the application with a crawler mount type power granular feeder may not be prevented by this exposure reduction measure. This should be assessed by the Member States in the context of product authorisation.
Potential emission to surface water due to leaching of contaminated percolation water is regulated in the Directive 1999/31/EC with technical standards and monitoring procedures laid down. The required measures enforce to minimalize environmental exposure to the appropriate standard required for discharge and hence, the risk to the sediment-dwelling organisms is acceptable for this use.

Drinking water

According to Directive 98/83/EC Annex I, part B, and Directive 80/778/EC Annex I, part D, the limit value for individual pesticides is 0.10 µg/L.

The limit value is exceeded for pyriproxyfen in the scenarios of direct application to surface water and indirect emission to surface water via STP after application in poultry housings for several scenarios. This means that in case of direct emissions and indirect emissions via the STP the use of pyriproxyfen does **not** comply with the drinking water criteria. This limit is not exceeded for groundwater used for drinking water after emission of treated manure to grassland or arable land.

Emission to surface water due to run-off after application of treated manure to agricultural soil in the step1 calculations exceed the limit value. In the refinement FOCUS step2 calculations, however, surface water concentrations in the worst case scenario are below the 0.1 µg/L limit value. The application of pyriproxyfen in animal housing with emission to manure does comply with the drinking water criteria.

Considering that all mitigation measures are in place, in line with the 1999/31/EC directive on landfills, the application of pyriproxyfen on waste treatment sites does not result in exposure of the aquatic compartment, and hence in this case, pyriproxyfen complies with the drinking water criteria.

Terrestrial compartment

<u>Invertebrates, plants and microorganisms</u>
The PEC/PNEC ratios for pyriproxyfen are >1 for the application of treated manure to grassland and arable land for 15 of the 18 scenarios. An acceptable risk to soil organisms is identified for the use of pyriproxyfen in animal houses for laying hens in compact battery cages (animal category 10), beef cattle (animal category 2) and dairy cows (milking parlour treatment, animal category 1).

Direct emissions to soil results from the application of Sumilarv® 0.5G for treatment of irrigation water. A PECsoil of 0.0059 mg a.s./kg wwt was calculated for Sumilarv® 0.5G applied in standing/running water used for irrigation after one single event, causing a PECsoil exceeding the PNECsoil of 0.0011 mg/kg wwt, and a risk for soil organisms is identified. Direct emission to soil at the waste treatment facility will occur. These facilities are, however, of low value and heavily controlled under other legislation (Directive 1999/31/EC (26 April 1999)), and therefore this aspect is not included in the risk assessment.

Due to the proposed mode of application (blower with granule nozzle or crawler mount type power granular feeder), emission to soil surrounding the waste treatment facilities may occur when the edges of waste treatment facilities are treated. Exposure reduction measures are possible, e.g. apply inwards from the edges of the waste treatment facilities. It should be noted that contamination of the surrounding environment as a consequence of drift resulting from the application with a crawler mount type power granular feeder may not be prevented by this exposure reduction measure. This should be assessed by the Member States in the context of product authorisation.

Groundwater

Use of pyriproxyfen on manure and the subsequent application to arable land does not present an unacceptable risk to groundwater in all scenarios. The 80th percentile average annual concentrations in groundwater were below 0.001 µg/L in any of the scenarios for pyriproxyfen or the metabolite 4'-OH-Pyriproxyfen with application of manure to arable land. The 80th percentile average annual concentration of PYPAC in ground water did not exceed 0.1 µg/L in any of the scenarios with application of manure to arable land.

Potential leaching to groundwater is covered by requirements of waste treatment facilities in Directive 1999/31/EC. Pollution prevention measures relate to achieved geological barriers and bottom liner in place during the operational/active phase and a combination of geological barriers and a top liner in place during the passive phase/post closure. Considering this, the risk for leaching to groundwater is acceptable for this use.

Terrestrial vertebrates

Primary poisoning
Exposure via consumption of granules
Exposure to granules is possible for waste tips. Considering the size and the composition of the granules (not based on an organic carrier having a nutritional value), intentional ingestion is not considered relevant. Based on exposure toxicity ratios of <1, the risk for mammals and birds as a result of accidental ingestion of granules is acceptable in both the qualitative acute and quantitative chronic assessment.

Exposure via food items contaminated with granules
PEC/PNEC ratios for non-target birds are <1 demonstrating an acceptable risk to scavenging birds from the proposed use on waste disposal areas. For mammals, the PEC/PNEC ratios for feeding on contaminated food items such as bread and a mixed diet of bread and meat are >1. This assessment is however based on worst-case assumptions, and in reality, the dietary exposure will be less than the PECfood,TWA values calculated. Furthermore, considering the strict controls on waste treatment plants, including measures that should be taken to prevent nuisance and hazards arising through birds and vermin, as well as the security to prevent free access to the site, the exposure of beneficial non-vertebrates is expected to be lower than assumed in the above assessment, and the risk for mammals as a result of the treatment of waste dump disposal areas in considered to be acceptable.

Secondary poisoning
Aquatic food chain

For the application of treated manure to grassland, the PEC/PNEC ratio for secondary poisoning via the aquatic food chain is 0.2, hence <1, and the risk is considered to be acceptable for this use.

For the direct application to surface water, the PEC/PNEC ratio is 11 and a risk is considered to be present for this use. Exposure reduction measures can be prescribed (use only in water without populations of water organisms other than the target organism (mosquito)).

Emission to surface water surrounding the waste treatment facilities may occur when the edges of waste treatment facilities are treated, due to the proposed mode of application (blower with granule nozzle or crawler mount type power granular feeder). Exposure reduction measures are possible, see section 2.2.2.5 aquatic compartment, and hence, the risk for secondary poisoning is acceptable for this use.
It should be assessed by the Member States in the context of product authorisation, whether these mitigation measures are sufficient to prevent drift for specific situations resulting from the application with e.g. a crawler mount type power granular feeder. Potential emission to surface water due to leaching of contaminated percolation water is regulated in the Directive 1999/31/EC with technical standards and monitoring procedures laid down. The required measures enforce to minimize environmental exposure to the appropriate standard required for discharge and hence, the risk to the aquatic compartment is acceptable for this use.

Terrestrial food chain
The PEC/PNEC ratio for secondary poisoning via the terrestrial food chain is 0.07, hence <1, and the risk is considered to be acceptable for the application of pyriproxyfen treated manure to agricultural land.
It is considered that for the application at waste treatment facilities the primary poisoning assessment (presented above) also covers the risk for secondary poisoning of birds and mammals from the consumption of contaminated soil organisms at and around waste disposal facilities treated with pyriproxyfen.

Summary risk characterisation for the environment

Tabel 2.2.2.5-1 summarises the risks predicted for the use of products containing pyriproxyfen

Table 2.2.2.5-1 Summary of risks predicted for the use of products containing pyriproxyfen

Intended Use		**Risk for compartment**						
	Air	**STP**	**Surface water**	**Sediment**	**Soil**	**Groundwater**	**Secondary poisoning birds and mammals**	**Primary poisoning birds and mammals**
Control of mosquitoes in standing water	-	-	X	X	X	n.a.	X aquatic food chain	√
Control of mosquitoes in running water	-	-	X	X	-	-	X aquatic food chain	√

Control of flies in animal housings								
via STP in poultry scenarios	-	√[1]	X	X	n.a.[1]	n.a.[1]	√	√
after manure application via run off	-	-	√[3]	√[3]	√[2]	√[2]	√	√
Control of flies in waste treatment facilities	-	√[4]	√[4]	√[4]	√[4]	√[4]	√[4]	√[4]

√ = pass - = not applicable, X = fail, n.a. = not assessed

[1] Cleaning water from animal housings will contain manure. In EU member states it is not permitted to discharge manure containing cleaning water to the sewer connected to an STP and therefore the risks for the soil and groundwater compartment have not been assessed for the use in poultry housings.

[2] Based on the risk assessment for soil organisms a safe use of Sumilarv® 0.5G is restricted to application in animal houses for laying hens in compact battery cages (animal category 10), beef cattle (animal category 2) and dairy cows (milking parlour treatment, animal category 1).

[3] A further restriction is required as not all types of receiving waters (FOCUS scenarios) show an acceptable risk for aquatic organisms.

[4] Following treatment of waste treatment sites, the risk is acceptable when mitigation measures are set in place.

2.2.3. List of endpoints

In order to facilitate the work of Member States in granting or reviewing authorisations, and to apply adequately the provisions of Article 5(1) of Directive 98/8/EC and the common principles laid down in Annex VI of that Directive, the most important endpoints, as identified during the evaluation process, are listed in Appendix I..

3. DECISION

3.1. Background to the Decision

Pyriproxyfen has been evaluated as an insecticide to.

1. Control flies (housefly, stable fly) in farm applications such as cattle pens, pig houses and poultry houses. The product should be broadcast over the entire surface of the floor, when manure lies on the floor, in particular around pillars, posts, corners where manure and muck easily accumulated (manure application).
2. Control flies (housefly, stable fly) in waste treatment facilities, i.e. municipal waste tips.
3. Control mosquitoes (including *Culex pipiens, Aedes aegypti, Aedes albopictus, Aedes togoi* and *Anopheles dirus*) in standing water.
4. Control mosquitoes (including *Culex pipiens, Aedes aegypti, Aedes albopictus, Aedes togoi* and *Anopheles dirus*) in running water.

The risk assessment for pyriproxyfen is based on the use of Sumilarv® 0.5G as an insecticide in animal houses, waste treatment facilities, standing and running water.

Physical chemical properties: purity/impurities
Pyriproxyfen and the biocidal product do not exhibit any particularly hazardous physical-chemical properties, and users are not considered to be at risk due to the physical-chemical properties of this active substance and the biocidal product.
Validated analytical methods were submitted for the determination of pyriproxyfen in technical material and the biocidal product Sumilarv® 0.5G, in soil, tap water and surface water and in air, with acceptable limits of quantification.

Efficacy
When used in animal houses (in pig and cattle houses but not for poultry houses) an effect on the emergence of adult flies was proven, although, the results were inconclusive regarding the effect on number of free-flying houseflies. Data were provided and accepted in support of the use against flies in waste treatment facilities, provided that the product is applied on compacted waste. The submitted data also supported the use for the control of *C. pipiens* and *A. togoi* (but not other mosquito species) in shallow standing water (but not in deep water) at doses of 0.05-0.1 mg/L (i.e. higher than the proposed dose of 0.01-0.05 mg a.s./L). Insufficient information was provided to support the proposed use for the control of mosquitoes in running water.

Human health
For the unprotected professional user, adverse health effects cannot be excluded due to combined dermal and respiratory exposure to pyriproxyfen, as a result of manual application of Sumilarv® 0.5G. For manual application by hand, a single layer of clothing and gloves will reduce the dermal exposure. For manual application by hand granule spreader, a single layer of clothing (no gloves) will reduce the dermal exposure. For manual application by blower with granule nozzle, coverall over a single layer of clothing and with gloves will reduce the dermal exposure. Correct use of this personal protection equipment will result in sufficient reduction of the exposure to pyriproxyfen for the manual application of Sumilarv® 0.5G.

Based on the risk assessment it can be concluded that no adverse health effects are expected for the unprotected professional user after the combined dermal and respiratory exposure to pyriproxyfen as a result of the mechanical application of Sumilarv® 0.5G.

Based on the risk assessment it can be concluded that no adverse health effects are expected for the general population after indirect exposure to pyriproxyfen as a result of the use of Sumilarv® 0.5G.

During the evaluation process, the concentration of the representative product changed from 0.5% to 0.525%. However, this change will not result in a different conclusion for the risk assessment. Therefore, it was decided that the presented calculations (using the 0.5% value) are sufficient to assess the risk for the representative product.

Environment

Exposure of the air compartment is unlikely because of the rapid oxidative degradation in air and/or low volatility of pyriproxyfen and metabolites. Pyriproxyfen does not meet the PBT and POPs criteria and inclusion in Annex I is therefore not restricted by these data.

For the treatment of running and standing water for the control of mosquitoes, a risk is identified for of aquatic, sediment and soil organisms and secondary poisoning via the aquatic food chain. Furthermore, pyriproxyfen does not comply with the drinking water criteria.

Based on the risk assessment for soil organisms a safe use of Sumilarv® 0.5G is restricted to application in animal houses for laying hens in compact battery cages (animal category 10), beef cattle (animal category 2) and dairy cows (milking parlour treatment, animal category 1). A further restriction is required as not all types of receiving waters (FOCUS scenarios) show an acceptable risk for aquatic organisms.

Following treatment of waste treatment sites, the risks to the environment are acceptable when mitigation measures are set in place.

Overall evaluation.

Data requirements for physico-chemical properties were fulfilled and users are not considered to be at risk due to the physical-chemical properties of the active substance and the biocidal product. Risk assessment for human health demonstrated that all proposed uses were safe for the professional user and the general population. Environmental risk assessment demonstrated that the risks to the environment are acceptable for the treatment of waste treatment sites (with use restrictions) and the application in animal houses for laying hens in compact battery cages (animal category 10), beef cattle (animal category 2) and dairy cows (milking parlour treatment, animal category 1). Efficacy was demonstrated for three of the proposed uses for which a risk assessment was carried out, namely that in animal houses (in pig and cattle houses but not for poultry houses), waste treatment facilities against flies, and that against mosquitoes in standing water (with use restrictions).

An inclusion of pyriproxyfen in Annex I can be granted, since for at least the proposed uses (waste treatment facilities and application in animal houses for beef cattle (animal category 2) and diary cows (animal category 1) efficacy has been demonstrated and these uses do not lead to an unacceptable risk for humans or the environment.

3.2. Decision regarding Inclusion in Annex I

Pyriproxyfen with a minimum purity of 970 g/kg (sum of isomers; racemate) shall be included in Annex I to Directive 98/8/EC as an active substance for use in product-type 18 (Insecticides, acaricides and products to control other arthropods), in professional products for use against flies and mosquitoes, subject to the following specific provisions:

1) products authorised for professionals shall be used with appropriate personal protective equipment, unless it can be demonstrated in the application for product authorisation that risks can be reduced to an acceptable level by other means;

2) products shall not be authorised for direct use on surface water, unless it can be demonstrated in the application for product authorisation that risks can be reduced to an acceptable level;

3) products intended to be used in waste treatment facilities shall be subject to appropriate risk mitigation measures to avoid contamination of the area outside the waste treatment site;

4) For products containing pyriproxyfen that may lead to residues in food or feed, Member States shall verify the need to set new or to amend existing maximum residue levels (MRLs) in accordance with Regulation (EC) No 470/2009 or Regulation (EC) No 396/2005, and take any appropriate risk mitigation measures ensuring that the applicable MRLs are not exceeded.

3.3. Elements to be taken into account by Member States when authorising products

Physical chemical properties, purity/impurities.
Related to the biocidal product Sumilarv® 0.5G:
For product authorisation, the notifier is requested to submit data on the auto-flammability of Sumilarv®
A particle size distribution determination is required including information on shape and weight of the granules.

Efficacy
Related to the biocidal product Sumilarv® 0.5G:
Data were provided and accepted in support of the use in waste treatment facilities against flies, provided that the product is applied on compacted waste. When used in animal houses (in pig and cattle houses but not for poultry houses) an effect on the emergence of adult flies was proven, although, the results were inconclusive regarding the effect on number of free-flying houseflies. The submitted data also supported the use for the control of *C. pipiens* and *A. togoi* (but not other mosquito species) in shallow standing water (but not in deep water) at doses of 0.05-0.1 mg/L (i.e. higher than the proposed dose of 0.01-0.05 mg a.s./L). For all other claims data have to be provided at product authorisation stage.
There are indications that there is a possibility of development of resistance, however the risk is not considered very high. Monitoring of resistance should be taken into account at product

authorisation. To prevent resistance the label should recommend alternation of the product with products containing an active substance with a different mode of action.

Health effects professional user
Related to the biocidal product Sumilarv® 0.5G:
During product evaluation at a Member State level the appropriate personal protection equipment corresponding with the use of the product by professional users should be described.

Indirect exposure was discussed during TMIII 2011. The following was concluded (more information given in DocIIB, for the concerning scenario's):

- In order to visualize risks for farmer's children -and possibly school children on visits to a farm- after oral and dermal contact to the biocidal product, a reverse reference can be undertaken.
- Exposure of livestock and human exposure via food of animal origin was not expected. For products containing pyriproxyfen that may lead to residues in food or feed, Member States shall verify the need to set new or to amend existing maximum residue levels (MRLs) according to Regulation (EC) No 470/2009 or Regulation (EC) No 396/2005, and take any appropriate risk mitigation measures ensuring that the applicable MRLs are not exceeded.

- Exposure of poultry is not expected (as granules are too small to be picked up), however, in order to visualize risks of exposure to poultry, reverse reference scenario can be undertaken at product authorisation level.

Environment
Related to the biocidal product Sumilarv® 0.5G:
It should be assessed by the Member States in the context of product authorisation whether all relevant FOCUS surface water scenarios are covered for specific circumstances and locations.

During product evaluation at a Member State level products shall not be authorised for direct use on surface water.

Against flies in animal houses this product can only be authorised for application in animal houses for laying hens in compact battery cages (animal category 10), beef cattle (animal category 2) and dairy cows (milking parlour treatment, animal category 1).

Data were provided and accepted in support of the use in waste treatment facilities against flies, provided that mitigation measures are set in place to avoid contamination of the area outside the waste treatment site:

- Prevent adverse effects in the environment due to drift of the biocidal product;
- Only apply the product in a blower facing the nozzle inwards in the direction of the waste facility;
- Only apply the product at wind speed 0, 1 or 2 beau fort;
- Application of the biocidal product at waste deposit facilities is only acceptable if the facility does not border to surface water.

In the context of product authorisation, the Member States should assess whether these mitigation measures are sufficient to prevent drift for specific situations resulting from the application with e.g. a crawler mount type power granular feeder.

3.4. Requirement for further information

It is considered that the evaluation has shown that sufficient data have been provided to verify the outcome and conclusions, and permit the proposal for the inclusion of pyriproxyfen for use in product-type PT 18 (insecticides, acaricides and products to control other arthropods) in Annex I to Directive 98/8/EC.

3.5. Updating this Assessment Report

This assessment report may need to be updated periodically in order to take account of scientific developments and results from the examination of any of the information referred to in Articles 7, 10.4 and 14 of Directive 98/8/EC. Such adaptations will be examined and finalised in connection with any amendment of the conditions for the inclusion of Pyriproxyfen in Annex I to the Directive.

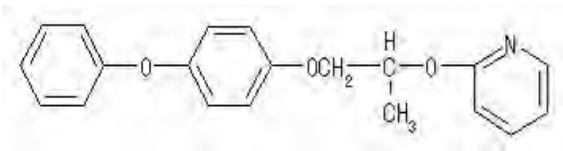
Appendix I: List of endpoints

Chapter 1: Identity, Physical and Chemical Properties, Classification and Labelling

Active substance (ISO Common Name)	Pyriproxyfen
Product-type	PT 18
Applicant	Name: Sumitomo Chemical (UK) PLC Address: Horatio House 75-85 Fulham Palace Road London, W6 8JA United Kingdom
Manufacturer of Active Substance	Name: Sumitomo Chemical Co. Ltd. Address: 27-1, Shinkawa 2-chome Chuo-ku Tokyo 104-8260 Japan.
Manufacturer of Product(s)	Name: Sumitomo Chemical Co. Ltd. Address: 27-1, Shinkawa 2-chome Chuo-ku Tokyo 104-8260 Japan.

Identity

Chemical name (IUPAC)	4-phenoxyphenyl (RS)-2-(2-pyridyloxy)propyl ether
Chemical name (CA)	2-[1-methyl-2-(4-phenoxyphenoxy)ethoxy]pyridine
CAS No	95737-68-1
EC No	429-800-1 (ELINCS)
Other substance No.	715 (CIPAC)
Minimum purity of the active substance as manufactured (g/kg or g/l)	970 g/kg (sum of isomers; racemate)
Identity of relevant impurities and additives (substances of concern) in the active substance as manufactured (g/kg)	No relevant impurities
Molecular formula	$C_{20}H_{19}NO_3$
Molecular mass	321.37

Structural formula	

Physical and chemical properties

Melting point (state purity)	48.0-50.0 °C (purity 100%)
Boiling point (state purity)	318 °C (purity 99.7%)
Temperature of decomposition	No decomposition up to 318 °C under N_2 atmosphere.
Appearance (state purity)	White granular solid (purity 100%) Pale yellowish white granular solid (purity 95.2%)
Relative density (state purity)	1.143 at 20 °C (purity 100%)
Surface tension	Not applicable (water solubility <1 mg/L)
Vapour pressure (in Pa, state temperature)	<1.33 x 10^{-5} Pa at 22.81 °C
Henry's law constant (Pa m^3 mol^{-1})	<4.23 x 10^{-2} Pa.m^3 mol^{-1} at 20-23 °C (calculated from vapour pressure and aqueous solubility at pH 7)
Solubility in water (g/l or mg/l, state temperature)	Water solubility at 20 °C (purity 100%) pH5: 0.058 mg/L pH7: 0.101 mg/L pH:9: 0.119 mg/L
Solubility in organic solvents (in g/l or mg/l, state temperature)	At 20 °C (purity 97.9%): *n*-Heptane 25 to 29 g/L 1,2-Dichloroethane >1000 g/L Methanol 25 to 29 g/L Acetone >1000 g/L *p*-Xylene >1000 g/L Ethyl acetate >1000 g/L
Stability in organic solvents used in biocidal products including relevant breakdown products	Not required as the biocidal product does not contain significant amounts of organic solvent
Partition coefficient (log P_{OW}) (state temperature)	Log Pow at 25 °C (purity 100%): pH5: 4.85 pH7: 4.86 pH9: 4.87
Hydrolytic stability (DT_{50}) (state pH and temperature)	At 50 °C: pH4: stable

	pH7: stable
	pH9: stable
Dissociation constant	Not determined due to the low water solubility of the test substance A pKa of 6.87 was obtained from Pkalc version 5.0 (module in PALLAS version 3.0; estimation performed by RMS).
UV/VIS absorption (max.) (if absorption > 290 nm state ε at wavelength)	max at 272 nm (ε = 6.91 x 10^3 L/ L.mol^{-1}.cm^{-1}) (purity 100%) ε at 290 nm ~ 2 x 10^3 L.mol^{-1}.cm^{-1}
Photostability (DT_{50}) (aqueous, sunlight, state pH)	Photolysis half-life under Xenon-light, buffer pH 7, 25 °C: 3.72-6.36 days.
Quantum yield of direct phototransformation in water at > 290 nm	Φ = 0.08661
Flammability	Not highly flammable (97.9% TGAI). No auto-ignition temperature below 400 °C (97.9% TGAI)
Explosive properties	Not explosive (97.9% TGAI)

Classification and proposed labelling

with regard to physical/chemical data	None
with regard to toxicological data	None
with regard to fate and behaviour data	None
with regard to ecotoxicological data	GHS09, Warning H400 “Very toxic to aquatic life” H410 “Very toxic to aquatic life with long lasting effects”

Chapter 2: Methods of Analysis

Analytical methods for the active substance

Technical active substance (principle of method)	Dissolution in methanol containing internal standard (*p*-benzyldiphenyl) followed by reversed phase HPLC-UV analysis.
Impurities in technical active substance (principle of method)	GC-FID and HPLC-UV

Analytical methods for residues

Soil (principle of method and LOQ)	BBA multi method L 00.00-34: Soil was extracted with acetone:water, partitioned with ethylacetate/cyclohexane, redissolved in ethylacetate/cyclohexane and subjected to gel permeation chromatography followed by reconstitution in ethyl acetate. After addition of iso-octane, the residue was passed through a silica gel column using subsequently hexane/toluene, toluene and toluene-acetone. The toluene-acetone eluate was evaporated to dryness and the residue redissolved in toluene before analysis by GC-NPD (confirmation by GC-MS). The LOQ (pyriproxyfen) was 0.01 mg/kg.
Air (principle of method and LOQ)	Air sampling cartridges (Tenax adsorption tubes) were extracted with toluene and analysed by GC-NPD (confirmation with GC-MS). LOQ: 1.0 µg/m^3 (~20°C, ~30% rH and ~35°C, ≥ 80% rH).
Water (principle of method and LOQ)	Tap water: 1L of tap water, distilled water, air and acetone were passed through a SPE C18 column. Surface water: 1L of surface water, distilled water, air and hexane were passed through a SPE C18 column. The acetone or hexane eluate was evaporated and the residue was reconstituted in toluene followed by GC-NPD analysis (confirmation by GC-MS). LOQ tap water (pyriproxyfen): 0.1 µg/L, LOQ surface water: 0.01 µg/L.
Body fluids and tissues (principle of method and LOQ)	Not required, not a toxic or very toxic compound.
Food/feed of plant origin (principle of method and LOQ for methods for monitoring purposes)	Not relevant as residues are not expected on food/feed of plant origin
Food/feed of animal origin (principle of method and LOQ for methods for monitoring purposes)	Not relevant as residues are not expected on food/feed of animal origin

Chapter 3: Impact on Human Health

Absorption, distribution, metabolism and excretion in mammals

Rate and extent of oral absorption:	40% based on radiolabel recovered in bile, urine, tissues, cage wash and carcass.
Rate and extent of dermal absorption:	13% based on dermal absorption study with an EC formulation.
Distribution:	Slightly (0.1-0.3% in tissues), highest residues in fat and liver.
Potential for accumulation:	No evidence of accumulation.
Rate and extent of excretion:	3-10% in urine in 24 hours, 46-76% in faeces in 24 hours, 28-34% in bile in 24 hours.
Toxicologically significant metabolite(s)	Parent compound.

Acute toxicity

Rat LD_{50} oral	> 5000 mg/kg bw
Rat LD_{50} dermal	> 2000 mg/kg bw
Rat LC_{50} inhalation	> 1.3 mg/L (max. attainable concentration)
Skin irritation	Non-irritant
Eye irritation	Non-irritant
Skin sensitization (test method used and result)	Non sensitizing (Maximization test)

Repeated dose toxicity

Species/ target / critical effect	Liver, red blood cells.
Lowest relevant oral NOAEL / LOAEL	1 year dog: 10 mg/kg bw/day
Lowest relevant dermal NOAEL / LOAEL	4 weeks rat: ≥ 1000 mg/kg bw/day
Lowest relevant inhalation NOAEL / LOAEL	4 weeks rat: 482 mg/m^3

Genotoxicity	No genotoxic potential.

Carcinogenicity

Species/type of tumour	No carcinogenic potential.
lowest dose with tumours	-

Reproductive toxicity

Species/ Reproduction target / critical effect	No fertility effects in rats. Decreased pup weight at parental toxic doses.
Lowest relevant reproductive NOAEL / LOAEL	≥ 333 mg/kg bw/day (parental NOAEL: 13.3 mg/kg bw/day)

Species/Developmental target / critical effect	No teratogenic effects in rats and rabbits. Increased number of foetuses with an opening of the foramen transversarium of the 7th cervical vertebra at maternal toxic doses.
Developmental toxicity	
Lowest relevant developmental NOAEL / LOAEL	100 mg/kg bw/day in rats. (maternal NOEL: 100 mg/kg bw/day)

Neurotoxicity / Delayed neurotoxicity

Species/ target/critical effect	No data available - not required. No concern from other studies.
Lowest relevant developmental NOAEL / LOAEL.	-

Other toxicological studies

...	No data available - not required.

Medical data

...	No evidence of toxicological concern from medical surveillance of manufacturing plant personnel.

Summary	Value	Study	Safety factor
Professional user			
ADI (acceptable daily intake, external long-term reference dose)	Not allocated - not necessary		
Medium/long-term AEL (Operator Exposure)	0.04 mg/kg bw/day	1-year dog	100, 40% oral absorption
Short-term AEL (Operator Exposure)	0.12 mg/kg bw/day	28-day rat	100, 40% oral absorption
MOE (Margin of exposure)	100		
ARfD (acute reference dose)	Not allocated - not necessary		
General population			
ADI (acceptable daily intake, external long-term reference dose)	Not allocated - not necessary		
AEL (Secondary Exposure)	0.04 mg/kg bw/day	1-year dog	100, 40% oral absorption
MOE (Margin of exposure)	100		
ARfD (acute reference dose)	Not allocated - not necessary		

Acceptable exposure scenarios (including method of calculation)

Professional users	AEL approach: A safe use was identified for professional users with PPE for manual applications, using PHED: Manual application, with PPE, no equipment: risk index 0.93 Manual application, with PPE, hand spreader: risk index 0.61 Manual application, with PPE, blower, risk index 0.75 A safe use was identified for professional users without PPE for mechanical applications, using PHED. Mechanical application, without PPE: risk index 0.01
	MOE approach: A safe use was identified for professional users with PPE for manual applications, using PHED: Manual application, with PPE, no equipment: MOE 108 Manual application, with PPE, hand spreader: MOE 167 Manual application, with PPE, blower, MOE 133 A safe use was identified for professional users without PPE for mechanical applications, using PHED. Mechanical application, without PPE, MOE 10000
Production of active substance:	No risk characterisation is made.
Formulation of biocidal product	No risk characterisation is made.
Intended uses	Insecticide in animal houses, waste tips, and water.
Secondary exposure	See indirect exposure below.
Non-professional users	Not applicable, product is intended for professional use only.
Indirect exposure as a result of use	AEL approach: A safe use was identified for the general population: Swimming in treated water, using EPA, adults, risk index 0.003 Swimming in treated water, using EPA, children, risk index 0.006 Laundering contaminated clothing, using PHED, risk index 0.3 Consumption edible parts of livestock, eggs and milk, risk index < 1 (not quantified).
	MOE approach: A safe use was identified for the general population: Swimming in treated water, using EPA, adults, MOE 36364 Swimming in treated water, using EPA, children, MOE 16667 Laundering contaminated clothing, using PHED, MOE 364 Consumption edible parts of livestock, eggs and milk, MOE > 100 (not quantified).

Chapter 4: Fate and Behaviour in the Environment

Route and rate of degradation in water

Hydrolysis of active substance and relevant metabolites (DT_{50}) (state pH and temperature)	pH4 and 50°C: stable
	pH7 and 50°C: stable
	pH9 and 50°C: stable
Photolytic / photo-oxidative degradation of active substance and resulting relevant metabolites	Xenon light; effective photolysis half-life: 3.7-6.4 d (mean 5.0, r^2 0.97) PYPA: maximum 70% (14 d) Assumed (polymerised) phenolic structures: maximum 60% AR (14 d)
Readily biodegradable (yes/no)	No
Biodegradation in seawater	No data and not required
Degradation in water/sediment - DT50 water - DT90 water - DT50 whole system - DT90 whole system - DT50 sediment - DT90 sediment	1.4-1.7 d (mean 1.6) (20°C) 4.6-5.5 d [1st order, r^2>0.94-0.97, n=2] 5.4-7.8 d (mean 6.6, geomean 6.5 at 20°C) (geomean 12.3 at 12 ºC) 17.9-26.1 d [1st order, r^2>0.76-0.98, n=2] 30.6-37.7 d (mean 34.2) (20°C) 102-125 d [1st order, r^2>0.78-0.93, n=2]
Mineralization	11-36% / 25-53% (pyridyl/phenyl) at 100 d, study end (n=2)
Non-extractable residues	31-37 / 39-51% (pyridyl/phenyl) at 100 d, study end (n=2)
Distribution in water / sediment systems (active substance)	Water pyriproxyfen 53-74 % at 0 d, 0.0% at 100 d (=at the end of the study) (n=4) Sediment pyriproxyfen 23-40 % at 0 d, 1.6-9.2% at 100 d (=at the end of the study) (n=4) Total system pyriproxyfen 94-97 % at 0 d, 1.6-9.2 at 100 d (=at the end of the study) (n=4)
Distribution in water / sediment systems (metabolites)	Water 4'-OH-pyriproxyfen maximum 1.4-4.8% (at 1-14 d, n=4) [DT_{50} 0.4-2.4 d, 1st order, r^2>0.74-0.99, n=3] DPH-Pyr maximum 1.4-11.8% (at 2-14 d, n=4) [DT_{50} 4 d, 1st order, r^2=0.97, n=2] PYPAC maximum 6.8-23.6% (at 50-100 d, n=2) [DT_{50} 9.1-33.9 d, 1st order, r^2=0.89-0.99, n=2] Sediment 4'-OH-pyriproxyfen maximum 9.2-14.8% (at 7-50 d, n=4) [DT_{50} 17.3-41.5 d, 1st order, r^2=0.95-0.99, n=3] DPH-Pyr maximum 2.6-4.3% (at 7-50 d, n=4) [DT_{50} 65.6d, 1st order, r^2=0.67, n=1] PYPAC maximum 4.3-7.6% (at 50-100 d, n=2) [DT_{50} 17-38.3 d, 1st order, r^2=0.70-0.93, n=2]

	Total system 4'-OH-pyriproxyfen maximum 9.2-15.9% (at 7-50 d, n=4). [DT_{50} 1.7-21.6 d, 1st order, r^2=0.83-0.99, n=3] (geomean 3.1 at 20°C, 5.9 at 12 ºC) DPH-Pyr maximum 8.5-12.7% (at 7-50 d, n=4) No total system half-live for DPH-Pyr could be obtained PYPAC maximum 11.1-31.2% (at 50-100 d, n=2). [DT_{50} 11.6-62.9 d, 1st order, r^2=0.96-0.98, n=2] (geomean 27.0 at 20°C, 51.2 at 12 ºC)

Route and rate of degradation in soil

Mineralization (aerobic)	11-42.5% after 90-94 d, [U-^{14}C-phenoxyphenyl] (n=2) (24-61 % after 91-94 d, [pyridyl-2,6-^{14}C] (n=6)
Laboratory studies (range or median, with number of measurements, with regression coefficient)	parent DT_{50lab} (20°C, aerobic): 2.8-25 d (mean 10, n=8, r^2 0.86-0.998) (geomean 7.8 at 20 ºC, 14.8 at 12 ºC) 4'-OH-pyriproxyfen DT_{50lab} (20°C, aerobic): 24-70 d (mean 38, n=4, r^2 0.74-0.86) (geomean 34.5 at 20 ºC, 65.4 at 12 ºC) PYPAC DT_{50lab} (20°C, aerobic): 0.4 -37.0 d (mean 19.1, n=3, r^2 ≥0.98) (geomean 6.8 at 20 ºC, 12.9 at 12 ºC) <u>For FOCUS gw modelling</u> DT_{50lab} (20°C, aerobic, moisture corrected): pyriproxyfen: 8.6 d 4'-OH-pyriproxyfen: 34.8 d PYPAC: 15.7d
	parent DT_{90lab} (20°C, aerobic): 9.2-81 d (mean 34, n=8, r^2 0.86-0.998) 4'-OH-pyriproxyfen DT_{90lab} (20°C, aerobic): 78-234 d (mean 126, n=4, r^2 0.74-0.86) PYPAC DT_{50lab} (20°C, aerobic): 1.3 - 123 d (n=3, r^2 >0.97)
	DT_{50lab} (10°C, aerobic): 22 d (n=8, based on Q10 factor of 2.2)
	anaerobic degradation: no data submitted.
	degradation in the saturated zone: no data submitted
Field studies (state location, range or median with number of measurements)	DT_{50f}: Mississippi, USA, bare soil, 3.5 d (n=1, r^2=0.92) 1st order Washington, USA, bare soil, 9.8 d (n=1, r^2=0.72) 1st order. New York, USA, bare soil in apple orchard, 8.3 d (n=1, r^2=0.96) 1st order.
	DT_{90f}: Mississippi, USA, bare soil, 12 d; Washington, USA, bare soil, 33 d; New York, USA, bare soil in apple orchard, 28 d
Anaerobic degradation	No studies submitted and not required.
Soil photolysis	Mineralisation maximum 0.3% at 3-14 d Non-extractable residues maximum 35% after 20 d, [U-^{14}C-phenoxyphenyl] (n=1) and 55% after 18 d, [pyridyl-2,6-^{14}C] (n=1)

	Major metabolites PYPAC, maximum 13% at 10 d [pyridyl-2,6-^{14}C] (n=1)
Non-extractable residues	51-58 % after 90-122 d, [U-^{14}C-phenoxyphenyl] (n=6) 30-49 % after 91-122 d, [pyridyl-2,6-^{14}C] (n=2)
Relevant metabolites - name and/or code, % of applied a.i. (range and maximum)	4'-OH-pyriproxyfen, maximum 0.9-6.3% at 1-14 d PYPAC, maximum 1.0-8.6% at 1-14 d
Soil accumulation and plateau concentration	not applicable

Adsorption/desorption

Ka_{oc}, Kd_{oc}	Koc: parent 11000-34200 (mean 21175, 1/n = 1.1-1.2, n=4) 4'-OH-Pyr 921-3811 (mean 2598, 1/n=0.77-1.0, n=3) PYPAC 9-32 (mean 20.7, 1/n=1.0-1.2, n=3)
Ka, Kd	Kf: parent 126-324 (mean 227, n=4) 4'-OH-Pyr 11.5-32.8 (mean 21.9, n=3) PYPAC 0.11-0.34 (mean 0.19, n=3)
pH dependence (yes / no) (if yes type of dependence)	No pH dependency is expected.
	<u>For FOCUS gw modelling</u> Koc: pyriproxyfen, mean 21175, 1/n=1.15 4'-OH-pyriproxyfen, mean 2598, 1/n=0.87 PYPAC, mean 20.7, 1/n=1.10

Fate and behaviour in air

Direct photolysis in air	No data submitted
Quantum yield of direct photolysis	No data submitted
Photo-oxidative degradation in air	Pyriproxyfen: DT50 of 0.26 d derived by the Atkinson method of calculation DT50 of 0.307 d derived by the TGD method of calculation ($0.5x10^6$ OH/cm^3; 24-h day time) PYPAC: DT50 of 0.6 d derived by the Atkinson method of calculation DT50 of 0.607 d derived by the TGD method of calculation ($0.5x10^6$ OH/cm^3; 24-h day time)
Volatilization	No data submitted and not required.

Monitoring data, if available

Soil (indicate location and type of study)	-
Surface water (indicate location and type of study)	-
Ground water (indicate location and type of study)	-
Air (indicate location and type of study)	-

Chapter 5: Effects on Non-target Species

Effects on Non-target Species

Toxicity data for aquatic species (most sensitive species of each group)

Species	Time-scale	Endpoint	Toxicity
Fish			
Lepomis macrochirus	96 hours	LC_{50}	>0.27 mg a.s./L
Oncorhynchus mykiss	95 days	NOEC	4.3 µg a.s./L
Invertebrates			
Daphnia magna	48 hours	EC_{50}	0.40 mg a.s./L
Daphnia magna	21 days	NOEC	15 ng a.s./L
Chironomus riparius	28 days	NOEC	2,2 µg a.s./L
Algae			
Selenastrum capricornutum	72 hours	E_rC_{50} NOE_rC	0.15 mg a.s./L 0.05 mg a.s./L
Microorganisms			
Domestic sewage sludge inoculum	3 hours	EC_{50}	>100 mg a.s./L

PYPAC

Species	Time-scale	Endpoint	Toxicity
Fish			
Oncorhynchus mykiss	96 hours	LC_{50}	>93 mg/L
Invertebrates			
Daphnia magna	48 hours	EC_{50}	>95 mg/L
Algae			
Pseudokirchneriella subcapitata	72 hours	E_rC_{50} NOE_rC	30 mg/L 22 mg/L

4'-OH-pyriproxyfen

Species	Time-scale	Endpoint	Toxicity
Fish			
Oncorhynchus mykiss	96 hours	LC_{50}	0.27 mg/L
Invertebrates			
Daphnia magna	48 hours	EC_{50}	1.8 mg/L
Algae			
Pseudokirchneriella	72 hours	E_rC_{50} NOE_rC	>2.5 mg/L 0.5 mg/L

DPH pyr

Species	Time-scale	Endpoint	Toxicity
Fish			
Oncorhynchus mykiss	96 hours	LC_{50}	5.1 mg/L
Invertebrates			
Daphnia magna	48 hours	EC_{50}	>9.8 mg/L
Algae			
Pseudokirchneriella subcapitata	72 hours	E_rC_{50} NOE_rC	>9.5 mg/L 2.0 mg/L

Effects on earthworms or other soil non-target organisms	
Acute toxicity to *Eisenia foetida foetida*	14-day LC_{50} >1000 mg a.s./kg
Reproductive toxicity	no data available

Effects on soil micro-organisms	
Nitrate transformation rate	28 days NOEC in loamy sand soil: $\geq$1.5 a.s./kg dw
Respiration rate	28 days NOEC in loamy sand soil: $\geq$1.5 mg a.s./kg dw

Effects on soil plants	
Barnyardgrass (*Echinochloa crus-galli*), oats *(Avena sativa*), velvetleaf (*Abutilon theophrasti*), radish (*Raphanus sativus*)	19 days >8000 g a.s./ha

Effects on terrestrial vertebrates	
Acute toxicity to mammals	LD_{50}: >5000 mg/kg bw (rat)
Acute toxicity to birds	LD_{50}: >1906 mg a.s./kg bw (*Colinus virginianus / Anas platyrhynchos*)
Dietary toxicity to birds	LC_{50}: >4956 mg a.s./kg diet (*Colinus virginianus / Anas platyrhynchos*)
Reproductive toxicity to birds	NOEC: $\geq$572 mg a.s./kg diet (*Colinus virginianus / Anas platyrhynchos*)

Effects on honeybees	
Acute oral toxicity	>100 µg a.s./bee
Acute contact toxicity	>100 µg a.s./bee

Effects on other beneficial arthropods	
Acute toxicity to *Aphidius rhopalosiphi*	LR_{50}: 213 g a.s./ha

Acute toxicity to *Typhlodromus pyri*	LR_{50}: 20 g a.s./ha

Bioconcentration

Bioconcentration factor (BCF)	1397-1495 L/kg (radioactivity); 581 L/kg (pyriproxyfen)
Depuration time(DT_{50})	0.86-1.63 days
(DT_{90})	3.4-8.4 days
Level of metabolites (%) in organisms accounting for > 10 % of residues	PP-label : 4'-OH-pyriproxyfen sulfate (10.7-15.5 / 7.2-12.2% TRR in edibles / non-edibles) 4',5''-OH-pyriproxyfen sulfate (7.7-13.3 / 30.0-34.0% TRR in edibles / non-edibles) 4'-OH-pyriproxyfen glucuronide (5.4-6.8 / 11.5-12.7% TRR in edibles / non-edibles) 4,4'-oxydiphenol sulfate (3.7-9.0 / 11.0-12.2% TRR in edibles / non-edibles) PYR-label: 4'-OH-pyriproxyfen sulfate (15.0-18.0 / 15.7-16.8% TRR in edibles / non-edibles) sum of the unresolved 4',5''-OH-pyriproxyfen sulfate and 5-OH-PYPAC sulfate (5.4-11.5 / 22.7-34.6% TRR in edibles / non-edibles)

Chapter 6: Other End Points

Appendix II: List of Intended Uses

Based on the intended use as presented below *, the human and environmental risk assessments were performed.

	Sumitomo Chemical Co., Ltd **Sumilarv 0.5G**
product description	Solid granules (95%= 297-590 micron) a.i. contents of the product: 0.51% w/w pure Pyriproxyfen (density 0.71-0.93 g/mL)
Organisms to be controlled	Flies and Mosquitoes; Flies: e.g. house fly – *Musca domestica*, stable fly- *Stomoxys calcitrans* Mosquitoes: including *Culex pipiens*, *Aedes aegypti*, *Aedes albopictus*, *Aedes togoi* and *Anopheles dirus*
Working mechanism	Juvenile hormone mimic and insect growth regulator. It interrupts the insect morphogenesis. It prevents (depending upon the time of application) egg hatching, metamorphosis of larvae into pupae, and, most importantly, pupae into adult.
Objects to be protected	1. Controlling flies in farm applications such as cattle pens, pig houses and poultry houses 2. Controlling flies also in waste treatment facilities, i.e. municipal waste tips. 3. Controlling mosquitoes in both running and standing water.
Dosage *	1. Animal houses: single application: 20 g product /m^2 (0.1 g a.i./m^2) or: 2 times 10 g product /m^2 (0.05 g a.i./m^2) with two weeks interval. 2. Waste treatment facilities (municipal waste tips): 20 g product /m^2 (0.1 g a.i./m^2). 3. Standing water: target concentration of 2-10 g product /m^3 (0.01 – 0.05 mg a.i./L). 4. Running water: Recommended application condition is 2-10 g product in 1 tonne of water, and it corresponds to 0.01-0.05 mg a.i./L. The amount applied (target concentration) is based on the running water volume per hour (i.e. width (m) x depth (m) x flow rate (m/hour).
Frequency	1. Animal house (fly control): once a month, worst case application: 6 times a year; 2. Waste treatment facilities (fly control): once a month, worst case application: 9 times a year; 3. Standing water (mosquito control): apply once a month, throughout the year if required 4. Running waters (mosquito control): in principle the same as for standing waters, however re-application rate does depend on the flow of the water, throughout the year if required.
Season/period for use	At the beginning of fly propagation. It should be applied before the adult fly population reaches nuisance. In animal houses this levels as follows: • 4-5 flies / m^2 in a poultry house • 4-5 flies / head in a pig house • 12 - 25 flies/head in a cattle house If the depth of manure is greater than 20 cm, another Sumilarv® 0.5G treatment is required. Below 10^oC flies will not breed.
Indoors/outdoors use	Applied in and outdoors. Animal houses specified: cattle pens, pig houses, poultry houses.
(Non) professional	Professional (professionals (daily use) and farmers);

	Sumitomo Chemical Co., Ltd **Sumilarv 0.5G**
Instruction for use	Indoor use (animal houses): Applied manually or by hand granule spreader Broadcast Sumilarv 0.5G over the entire surface of the floor, when manure lies on the floor. Particular around pillars, posts, corners where manure and muck easily accumulated. Outdoor use (waste treatment facilities standing and running waters): blower with granule nozzle or crawler mount type power granular feeder. For running waters the product is applied to the slow moving sections where mosquitoes breed rather than in fast moving waters.

* : The dosages mentioned in this table are used for the risk assessment. Efficacy is not proven for all uses with these dosages, however for some of the safe uses efficacy was proven.
When used in animal houses (in pig and cattle houses but not for poultry houses) an effect on the emergence of adult flies was proven, although, the results were inconclusive regarding the effect on number of free-flying houseflies. Data were provided and accepted in support of the use against flies in waste treatment facilities, provided that the product is applied on compacted waste. The submitted data also supported the use for the control of *C. pipiens* and *A. togoi* (but not other mosquito species) in shallow standing water (but not in deep water) at doses of 0.05-0.1 mg/L (i.e. higher than the proposed dose of 0.01-0.05 mg a.s./L). Insufficient information was provided to support the proposed use for the control of mosquitoes in running water.
See also DOC I 2.1.2 and DOCIIB 2.3 and 2.5 for an overview on the efficacy results.

List of standard terms and abbreviations

Stand. term / Abbreviation	**Explanation**
A	ampere
ACh	acetylcholine
AChE	acetylcholinesterase
ADI	acceptable daily intake
ADME	administration distribution metabolism and excretion
ADP	adenosine diphosphate
AE	acid equivalent
AF	assessment factor
AFID	alkali flame-ionisation detector or detection
A/G	albumin/globulin ratio
ai	active ingredient
ALD_{50}	approximate median lethal dose, 50%
ALT	alanine aminotransferase (SGPT)
Ann.	Annex
AEL	acceptable operator exposure level
AMD	automatic multiple development
ANOVA	analysis of variance
AP	alkaline phosphatase
approx	approximate
AR	Applied Radioactivity
ARC	anticipated residue contribution
ARfD	acute reference dose
as	active substance
AST	aspartate aminotransferase (SGOT)
ASV	air saturation value
ATP	adenosine triphosphate
BAF	bioaccumulation factor
BCF	bioconcentration factor
bfa	body fluid assay
BOD	biological oxygen demand
bp	boiling point

Stand. term / Abbreviation	**Explanation**
BPD	Biocidal Products Directive
BSAF	biota-sediment accumulation factor
BSE	bovine spongiform encephalopathy
BSP	bromosulfophthalein
Bt	*Bacillus thuringiensis*
Bti	*Bacillus thuringiensis israelensis*
Btk	*Bacillus thuringiensis kurstaki*
Btt	*Bacillus thuringiensis tenebrionis*
BUN	blood urea nitrogen
bw	body weight
c	centi- (x 10^{-2})
°C	degrees Celsius (centigrade)
CA	controlled atmosphere
CAD	computer aided design
CADDY	computer aided dossier and data supply (an electronic dossier interchange and archiving format)
cd	candela
CDA	controlled drop(let) application
cDNA	complementary DANN
CEC	cation exchange capacity
cf	confer, compare to
CFU	colony forming units
ChE	cholinesterase
CI	confidence interval
CL	confidence limits
cm	centimetre
CNS	central nervous system
COD	chemical oxygen demand
CPK	creatinine phosphatase
CT50	period required for 50% elimination
CT90	period required for 90% elimination

Stand. term / Abbreviation	**Explanation**
cv	coefficient of variation
Cv	ceiling value
d	day(s)
DAR	Draft Assessment Report
$DDSD_{rwc}$	reasonable worst-case daily dry soil dose
DES	diethylstilboestrol
DIS	draft international standard *(ISO)*
DMSO	dimethylsulfoxide
DNA	deoxyribonucleic acid
dna	designated national authority
DO	dissolved oxygen
DOC	dissolved organic carbon
dpi	days post inoculation
DRP	detailed review paper *(OECD)*
$DT_{50(lab)}$	period required for 50 percent dissipation (under laboratory conditions) (define method of estimation)
$DT_{90(field)}$	period required for 90 percent dissipation (under field conditions) (define method of estimation)
dw	dry weight
DWQG	drinking water quality guidelines
ε	decadic molar extinction coefficient
EC_{50}	median effective concentration
E_bC_{50}	median effective concentration for biomass
ECD	electron capture detector
ED	Endocrine Disruption
ED_{50}	median effective dose
EDI	estimated daily intake
EINECS	European inventory of existing commercial substances
ELINCS	European list of notified chemical substances
ELISA	enzyme linked immunosorbent assay

Stand. term / Abbreviation	**Explanation**
e-mail	electronic mail
EMDI	estimated maximum daily intake
EN	European norm
EP	Equilibrium Partitioning method
EPMA	electron probe micro-analysis
ER_{50}	median effective rate
E_rC_{50}	median effective concentration for growth rate
ERL	extraneous residue limit
ESPE46/51	evaluation system for pesticides
EUSES	European Union system for the evaluation of substances
F	field
F_0	parental generation
F_1	filial generation, first
F_2	filial generation, second
FBS	full base set
FELS	fish early-life stage
FIA	fluorescence immuno-assay
FID	flame ionisation detector
F_{mol}	fractional equivalent of the metabolite´s molecular weight compared to the active substance
FOB	functional observation battery
f_{oc}	organic carbon factor (compartment dependent)
Foc_{susp}	weight fraction organic carbon on suspended solids
Fom_{soil}	fraction organic matter in soil
fp	freezing point
FPD	flame photometric detector
FPLC	fast protein liquid chromatography
$Fsolid_{susp}$	volume fraction solids in suspended matter
f_{TWA}	time weighted average factor
$Fwater_{susp}$	volume fraction water in suspended matter
g	gram(s)

Stand. term / Abbreviation	**Explanation**
GAP	good agricultural practice
GC	gas chromatography
GC-EC	gas chromatography with electron capture detector
GC-FID	gas chromatography with flame ionisation detector
GC-MS	gas chromatography-mass spectrometry
GC-MSD	gas chromatography with mass-selective detection
GEP	good experimental practice
GFP	good field practice
GGT	gamma glutamyl transferase
GI	gastro-intestinal
GIT	gastro-intestinal tract
GL	guideline level
GLC	gas liquid chromatography
GLP	good laboratory practice
$G_{loading}$	amount of a.s. in one granule
GM	geometric mean
GMO	genetically modified organism
GMM	genetically modified micro-organism
GPC	gel-permeation chromatography
GPS	global positioning system
GSH	glutathione
GV	granulosevirus
h	hour(s)
H	Henry's Law constant (calculated as a unitless value)
ha	hectare(s)
HB	haemoglobin
HC5	concentration which will be harmless to at least 95 % of the species present with a given level of confidence (usually 95 %)
HCG	human chorionic gonadotropin
HCT	haematocrit

Stand. term / Abbreviation	**Explanation**
HDT	highest dose tested
hL	hectolitre
HEED	high energy electron diffraction
HID	helium ionisation detector
HPAEC	high performance anion exchange chromatography
HPLC	high pressure liquid chromatography or high performance liquid chromatography
HPLC-MS	high pressure liquid chromatography - mass spectrometry
HPPLC	high pressure planar liquid chromatography
HPTLC	high performance thin layer chromatography
HRGC	high resolution gas chromatography
H_S	Shannon-Weaver index
Ht	haematocrit
HUSS	human and use safety standard
I	indoor
I_{50}	inhibitory dose, 50%
IC_{50}	median immobilisation concentration or median inhibitory concentration 1
ICM	integrated crop management
ID	ionisation detector
IEDI	international estimated daily intake
IGR	insect growth regulator
im	intramuscular
inh	inhalation
INT	2-p-iodophenyl-3-p-nitrophenyl-5-phenyltetrazoliumchloride testing method
ip	intraperitoneal
IPM	integrated pest management
IR	infrared
ISBN	international standard book

Stand. term / Abbreviation	**Explanation**
	number
ISSN	international standard serial number
IUCLID	International Uniform Chemical Information Database
iv	intravenous
IVF	*in vitro* fertilisation
k *(in combination)*	kilo
k	rate constant for biodegradation
K	Kelvin
Ka	acid dissociation constant
Kb	base dissociation constant
K_{ads}	adsorption constant
K_{des}	apparent desorption coefficient
kg	kilogram
K_H	Henry´s Law constant (in atmosphere per cubic metre per mole)
K_{oc}	organic carbon adsorption coefficient
K_{om}	organic matter adsorption coefficient
Kp	solid-water partition coefficient
Kp_{susp}	solids water partition coefficient in suspended matter
kPa	kilopascal(s)
$K_{susp\text{-}water}$	partition coefficient suspended matter water
l, L	litre
LAN	local area network
LASER	light amplification by stimulated emission of radiation
LBC	loosely bound capacity
LC	liquid chromatography
LC-MS	liquid chromatography- mass spectrometry
LC_{50}	lethal concentration, median
LCA	life cycle analysis

Stand. term / Abbreviation	**Explanation**
LC-MS-MS	liquid chromatography with tandem mass spectrometry
LD_{50}	lethal dose, median; dosis letalis media
LDH	lactate dehydrogenase
ln	natural logarithm
LOAEC	lowest observable adverse effect concentration
LOAEL	lowest observable adverse effect level
LOD	limit of detection
LOEC	lowest observable effect concentration
LOEL	lowest observable effect level
log	logarithm to the base 10
LOQ	limit of quantification (determination)
LPLC	low pressure liquid chromatography
LR_{50}	lethal rate, median
LSC	liquid scintillation counting or counter
LSD	least squared denominator multiple range test
LSS	liquid scintillation spectrometry
LT	lethal threshold
m	metre
M	molar
µm	micrometre (micron)
MAC	maximum allowable concentration
MAK	maximum allowable concentration
MC	moisture content
MCH	mean corpuscular haemoglobin
MCHC	mean corpuscular haemoglobin concentration
MCV	mean corpuscular volume
MDL	method detection limit
MFO	mixed function oxidase
µg	microgram

Stand. term / Abbreviation	**Explanation**
mg	milligram
MHC	moisture holding capacity
MIC	minimum inhibitory concentration
min	minute(s)
MKC	minimum killing concentration
mL	millilitre
MLT	median lethal time
MLD	minimum lethal dose
mm	millimetre
MMAD	mass median aerodynamic diameter
mo	month(s)
MOE	margin of exposure
mol	mole(s)
MOS	margin of safety
mp	melting point
MRE	maximum residue expected
MRL	maximum residue level or limit
mRNA	messenger ribonucleic acid
MS	1) mass spectrometry; 2) member state
MSDS	material safety data sheet
MTD	maximum tolerated dose
MT	material test
MW	molecular weight
n.a.	not applicable
n-	normal (defining isomeric configuration)
n	number of observations
NAEL	no adverse effect level
nd	not detected
NEDI	national estimated daily intake
NEL	no effect level
NERL	no effect residue level
ng	nanogram
nm	nanometre

Stand. term / Abbreviation	**Explanation**
NMR	nuclear magnetic resonance
no, n°	number
NOAEC	no observed adverse effect concentration
NOAEL	no observed adverse effect level
NOEAEC	no observed environmental adverse effect concentration
NOEC	no observed effect concentration
NOED	no observed effect dose
NOEL	no observed effect level
NOIS	notice of intent to suspend
NPD	nitrogen-phosphorus detector or detection
NPV	nuclear polyhedrosis virus
NR	not reported
NTE	neurotoxic target esterase
OC	organic carbon content
OCR	optical character recognition
ODP	ozone-depleting potential
ODS	ozone-depleting substances
OEL	occupational exposure limit
OGD	one granule dose
OH	hydroxide
OJ	Official Journal
OM	organic matter content
Pa	pascal
PAD	pulsed amperometric detection
2-PAM	2-pralidoxime
pc	paper chromatography
PC	personal computer
PCV	haematocrit (packed corpuscular volume)
PEC	predicted environmental concentration
PEC_A	predicted environmental concentration in air
$PEC_{food,TWA}$	time weighted average predicted environmental concentration in

Stand. term / Abbreviation	**Explanation**
	food
$PEC_{oral,predator}$	predicted environmental concentration in food of fish- or earthworm-eating predators
PEC_S	predicted environmental concentration in soil
PEC_{SED}	predicted environmental concentration in sediment
PEC_{STP}	predicted environmental concentration in sewage treatment plant
PEC_{SW}	predicted environmental concentration in surface water
PEC_{GW}	predicted environmental concentration in ground water
PED	plasma-emissions-detector
pH	pH-value
PHED	pesticide handler's exposure data
PIC	prior informed consent
pic	phage inhibitory capacity
PIXE	proton induced X-ray emission
pKa	negative logarithm (to the base 10) of the acid dissociation constant
pKb	negative logarithm (to the base 10) of the base dissociation constant
PNEC	predicted no effect concentration (compartment to be added as subscript)
po	by mouth
POP	persistent organic pollutants
P_{ow}	octanol-water partition coefficient
ppb	parts per billion (10^{-9})
PPE	personal protective equipment
ppm	parts per million (10^{-6})
PPP	plant protection product
ppq	parts per quadrillion (10^{-24})
ppt	parts per trillion (10^{-12})
PRC	principle component analysis
PSP	phenolsulfophthalein

Stand. term / Abbreviation	**Explanation**
PrT	prothrombin time
PRL	practical residue limit
PT	product type
PT(CEN)	project team CEN
PTDI	provisional tolerable daily intake
PTT	partial thromboplastin time
QA	quality assurance
QAU	quality assurance unit
(Q)SAR	quantitative structure-activity relationship
r	correlation coefficient
r^2	coefficient of determination
RA	risk assessment
RBC	red blood cell
REI	restricted entry interval
RENI	Registry Nomenclature Information System
Rf	retardation factor
RfD	reference dose
RH	relative humidity
RHO_{solid}	density of the solid phase
RHOsusp	bulk density of wet suspended matter
RL_{50}	median residual lifetime
RNA	ribonucleic acid
RP	reversed phase
rpm	revolutions per minute
rRNA	ribosomal ribonucleic acid
RRT	relative retention time
RSD	relative standard deviation
s	second
S	solubility
SAC	strong adsorption capacity
SAP	serum alkaline phosphatase
SAR	structure/activity relationship
SBLC	shallow bed liquid chromatography

Stand. term / Abbreviation	**Explanation**
sc	subcutaneous
sce	sister chromatid exchange
SCAS	semi-continous activated sludge
SCTER	smallest chronic toxicity exposure ratio (TER)
SD	standard deviation
se	standard error
SEM	standard error of the mean
SEP	standard evaluation procedure
SF	safety factor
SFC	supercritical fluid chromatography
SFE	supercritical fluid extraction
SIMS	secondary ion mass spectroscopy
S/L	short term to long term ratio
SMEs	small and medium sized enterprises
SOP	standard operating procedures
sp	species (only after a generic name)
SPE	solid phase extraction
SPF	specific pathogen free
spp	subspecies
SSD	sulphur specific detector
SSMS	spark source mass spectrometry
STEL	short term exposure limit
STER	smallest toxicity exposure ratio (TER)
STMR	supervised trials median residue
STP	sewage treatment plant
t	tonne(s) (metric ton)
$t_{½}$	half-life (define method of estimation)
T_3	tri-iodothyroxine
T_4	thyroxine
T_{25}	tumorigenic dose that causes tumours in 25 % of the test animals
TADI	temporary acceptable daily intake
TBC	tightly bound capacity

Stand. term / Abbreviation	**Explanation**
TCD	thermal conductivity detector
TG	technical guideline, technical group
TGD	Technical guidance document
TID	thermionic detector, alkali flame detector
TDR	time domain reflectrometry
TER	toxicity exposure ratio
TER_I	toxicity exposure ratio for initial exposure
TER_{ST}	toxicity exposure ratio following repeated exposure
TER_{LT}	toxicity exposure ratio following chronic exposure
tert	tertiary (in a chemical name)
TEP	typical end-use product
TGGE	temperature gradient gel electrophoresis
TIFF	tag image file format
TLC	thin layer chromatography
Tlm	median tolerance limit
TLV	threshold limit value
TMDI	theoretical maximum daily intake
TMRC	theoretical maximum residue contribution
TMRL	temporary maximum residue limit
TNsG	technical notes for guidance
TOC	total organic carbon
Tremcard	transport emergency card
tRNA	transfer ribonucleic acid
TRR	total radioactivity residue
TSH	thyroid stimulating hormone (thyrotropin)
TTC	2,3,5-triphenylterazoliumchloride testing method
TWA	time weighted average
UDS	unscheduled DNA synthesis
UF	uncertainty factor (safety factor)

Stand. term / Abbreviation	**Explanation**
ULV	ultra low volume
UR	unit risk
UV	ultraviolet
UVC	unknown or variable composition, complex reaction products
UVCB	undefined or variable composition, complex reaction products in biological material
v/v	volume ratio (volume per volume)
vis	visible
WBC	white blood cell
wk	week
wt	weight
w/v	weight per volume
ww	wet weight
w/w	weight per weight
XRFA	X-ray fluorescence analysis
yr	year
<	less than
≤	less than or equal to
>	greater than
≥	greater than or equal to