EUROPEAN COMMISSION
DIRECTORATE-GENERAL HEALTH & CONSUMER PROTECTION

Directorate D - Food Safety: production and distribution chain
D3 - Chemicals, Contaminants and Pesticides

Esfenvalerate

6846/VI/97-final

3 October 2005[1]

Review report for the active substance esfenvalerate

Finalised in the Standing Committee on Plant Health at its meeting on 13 July 2000 in view of the inclusion of esfenvalerate in Annex I of Directive 91/414/EEC

1. Procedure followed for the re-evaluation process

This review report has been established as a result of the re-evaluation of esfenvalerate, made in the context of the work programme for review of existing active substances provided for in Article 8(2) of Directive 91/414/EEC concerning the placing of plant protection products on the market, with a view to the possible inclusion of this substance in Annex I to the Directive.

Commission Regulation (EEC) No 3600/92([2]) laying down the detailed rules for the implementation of the first stage of the programme of work referred to in Article 8(2) of Council Directive 91/414/EEC, as last amended by Regulation (EC) No 1972/99[3], has laid down the detailed rules on the procedure according to which the re-evaluation has to be carried out. Esfenvalerate is one of the 90 existing active substances covered by this Regulation.

In accordance with the provisions of Article 4 of Regulation (EEC) No 3600/92, Sumitomo (UK) plc on 21 July 1993 and United Phosphorus Ltd on 26 July 1993 notified to the Commission of their wish to secure the inclusion of the active substance esfenvalerate in Annex I to the Directive.

In accordance with the provisions of Article 5 of Regulation (EEC) No 3600/92, the Commission, by its Regulation (EEC) No 933/94([4]), as last amended by Regulation (EC) No 2230/95([5]), designated Portugal as rapporteur Member State to carry out the assessment of esfenvalerate on the basis of the dossiers submitted by the notifiers. In the same Regulation, the Commission specified furthermore the deadline for the notifiers with regard to the submission to the rapporteur Member States of the dossiers required under Article 6(2) of Regulation (EEC) No

[1] A correction has been made due to a typing mistake in the NOEC for reproductive toxicity of Mallard duck and the Standing Committee on Food Chain and Animal Health has taken note of it on 18 November 2005.
[2] OJ No L 366, 15.12.1992, p.10.

[3] OJ No L 244, 16.9.1999, p. 41.

[4] OJ No L 107, 28.04.1994, p.8.

[5] OJ No L 225, 22.09.1995, p.1.

3600/92, as well as for other parties with regard to further technical and scientific information; for esfenvalerate this deadline was 30 April 1995.

Only Sumitomo (UK) plc submitted a dossier to the rapporteur Member State which was considered as complete. United Phosphorus Ltd has withdrawn their notification by a letter of 26 January 1995 and did not submit a dossier.

In accordance with the provisions of Article 7(1) of Regulation (EEC) No 3600/92, Portugal submitted on 11 October 1996 to the Commission the report of its examination, hereafter referred to as the draft assessment report, including, as required, a recommendation concerning the possible inclusion of esfenvalerate in Annex I to the Directive. Moreover, in accordance with the same provisions, the Commission and the Member States received also the summary dossier on esfenvalerate from Sumitomo (UK) plc, on 10 February 1997.

In accordance with the provisions of Article 7(3) of Regulation (EEC) No 3600/92, the Commission forwarded for consultation the draft assessment report to all the Member States as well as to Sumitomo (UK) plc being the main data submitter, on 11 February 1997.

The Commission organised an intensive consultation of technical experts from a certain number of Member States, to review the draft assessment report and the comments received thereon (peer review), in particular on each of the following disciplines:

- identity and physical /chemical properties ;
- fate and behaviour in the environment ;
- ecotoxicology ;
- mammalian toxicology ;
- residues and analytical methods ;
- regulatory questions.

The meetings for this consultation were organised on behalf of the Commission by the Biologische Bundesanstalt für Land und Forstwirtschaft (BBA) in Braunschweig, Germany, from April to July 1997.

The report of the peer review (i.e. full report) was circulated, for further consultation, to Member States and the main data submitter on 30 July 1997 for comments and further clarification.

In accordance with the provisions of Article 6(4) of Directive 91/414/EEC concerning consultation in the light of a possible unfavourable decision for the active substance the Commission organised a tripartite meeting with the main data submitter and the rapporteur Member State for this active substance on 21 January 1998.

In accordance with the provisions of Article 7(3) of Regulation (EEC) No 3600/92, the dossier, the draft assessment report, the peer review report (i.e. full report) and the comments and clarifications on the remaining issues, received after the peer review were referred to the Standing Committee on Plant Health, and specialised working groups of this Committee, for final examination, with participation of experts from the 15 Member States. This final examination took place from February 1998 to May 2000, and was finalised in the meeting of the Standing Committee on 13 July 2000.

The present review report contains the conclusions of this final examination; given the importance of the draft assessment report, the peer review report (i.e. full report) and the comments and clarifications submitted after the peer review as basic information for the final examination process, these documents are considered respectively as background documents A, B and C to this review report and are part of it.

These documents were also submitted to the Scientific Committee for Plants for separate consultation. The report of this Committee was formally adopted on 17 March 2000[6].

2. Purposes of this review report

This review report, including the background documents and appendices thereto, have been developed and finalised in support of the Directive 2000/67/EC concerning the inclusion of esfenvalerate in Annex I to Directive 91/414/EEC, and to assist the Member States in decisions on individual plant protection products containing esfenvalerate they have to take in accordance with the provisions of that Directive, and in particular the provisions of article 4(1) and the uniform principles laid down in Annex VI.

This review report provides also for the evaluation required under Section A.2.(b) of the above mentioned uniform principles, as well as under several specific sections of part B of these principles. In these sections it is provided that Member States, in evaluating applications and granting authorisations, shall take into account the information concerning the active substance in Annex II of the directive, submitted for the purpose of inclusion of the active substance in Annex I, as well as the result of the evaluation of those data.

In accordance with the provisions of Article 7(6) of Regulation (EEC) No 3600/92, Member States will keep available or make available this review report for consultation by any interested parties or will make it available to them on their specific request. Moreover the Commission will send a copy of this review report (not including the background documents) to all operators having notified for this active substance under Article 4(1) of this Regulation.

The information in this review report is, at least partly, based on information, which is confidential and/or protected under the provisions of Directive 91/414/EEC. It is therefore recommended that this review report would not be accepted to support any registration outside the context of Directive 91/414/EEC, e.g. in third countries, for which the applicant has not demonstrated to have regulatory access to the information on which this review report is based.

3. Overall conclusion in the context of Directive 91/414/EEC

The overall conclusion from the evaluation is that it may be expected that plant protection products containing esfenvalerate will fulfil the safety requirements laid down in Article 5(1)(a) and (b) of Directive 91/414/EEC. This conclusion is however subject to compliance with the particular requirements in sections 4, 5, 6 and 7 of this report, as well as to the implementation of the provisions of Article 4(1) and the uniform principles laid down in Annex VI of Directive 91/414/EEC, for each esfenvalerate containing plant protection product for which Member States will grant or review the authorisation.

[6] Opinion of the scientific Committee on Plants regarding the inclusion of esfenvalerate in Annex I to Council Directive 91/414/EEC concerning the placing of plant protection products on the market. SCP/EFEN002/final.

Furthermore, these conclusions were reached within the framework of a range of uses, which were proposed and supported by the main data submitter, as outlined in Background document C of this report.

Extension of the use pattern beyond those reviewed will require an evaluation at Member State level in order to establish whether the proposed extensions of use can satisfy the requirements of Article 4(1) and of the uniform principles laid down in Annex VI of Directive 91/414/EEC.

With particular regard to residues, the review has established that the residues arising from the proposed uses, consequent on application consistent with good plant protection practice, have no harmful effects on human or animal health. The Theoretical Maximum Daily Intake (TMDI; excluding water and products of animal origin) for a 60 kg adult is 2 % of the Acceptable Daily Intake (ADI), based on the FAO/WHO European Diet (August 1994). Estimates of acute dietary exposure of adults and toddlers do not exceed the Acute Reference Dose (ARfD).

The review has identified several acceptable exposure scenarios for operators, workers and bystanders, which require however to be confirmed for each plant protection product in accordance with the relevant sections of the above mentioned uniform principles.

The review has also concluded that under the proposed and supported conditions of use there are no unacceptable effects on the environment, as provided for in Article 4 (1) (b) (iv) and (v) of Directive 91/414/EEC, provided that certain conditions are taken into account as detailed in section 6 of this report.

4. Identity and Physical/chemical properties

The main identity and the physical/chemical properties of esfenvalerate are given in Appendix I.

The active substance shall comply with the specification given in Appendix I of this report.

The review has established that for the active substance notified by the main data submitter Sumitomo (UK) plc, none of the manufacturing impurities considered are, on the basis of information currently available, of toxicological or environmental concern.

5. Endpoints and related information

In order to facilitate Member States, in granting or reviewing authorisations, to apply adequately the provisions of Article 4(1) of Directive 91/414/EEC and the uniform principles laid down in Annex VI of that Directive, the most important endpoints as identified during the re-evaluation process are set out under point 1 above. These endpoints are listed in Appendix II.

6. Particular conditions to be taken into account on short term basis by Member States in relation to the granting of authorisations of plant protection products containing esfenvalerate

On the basis of the proposed and supported uses, the following issues have been identified as requiring particular and short term attention from all Member States, in the framework of any authorisations to be granted, varied or withdrawn, as appropriate:

- For the protection of aquatic organisms, risk mitigation measures should be applied where appropriate.
- For the protection of non-target arthropods, risk mitigation measures should be applied where appropriate.

7. List of studies to be generated

No further studies were identified which were at this stage considered necessary in relation to the inclusion of esfenvalerate in Annex I under the current inclusion conditions.

Some endpoints however may require the generation or submission of additional studies to be submitted to the Member States in order to ensure authorisations for use under certain conditions. This may particularly be the case for

- field studies to asses the effects of esfenvalerate on non-target arthropods under more realistic conditions.

8. Information on studies with claimed data protection

For information of any interested parties, Appendix III gives information about the studies for which the main data submitter has claimed data protection and which during the re-evaluation process were considered as essential with a view to annex I inclusion. This information is only given to facilitate the operation of the provisions of Article 13 of Directive 91/414/EEC in the Member States. It is based on the best information available to the Commission services at the time this review report was prepared; but it does not prejudice any rights or obligations of Member States or operators with regard to its uses in the implementation of the provisions of Article 13 of the Directive 91/414/EEC neither does it commit the Commission.

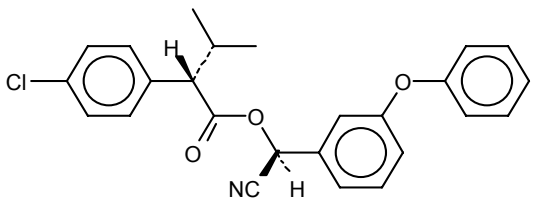
9. Updating of this review report

The technical information in this report may require to be updated from time to time in order to take account of technical and scientific developments as well as of the results of the examination of any information referred to the Commission in the framework of Articles 7, 10 or 11 of Directive 91/414/EEC. Such adaptations will be examined and finalised in the Standing Committee on Plant Health, in connection with any amendment of the inclusion conditions for esfenvalerate in Annex I of the Directive.

APPENDIX I

Identity, physical and chemical properties

ESFENVALERATE

Common name (ISO)	Esfenvalerate
Chemical name (IUPAC)	(S)-α-Cyano-3-phenoxybenzyl-(S)-2-(4-chlorophenyl)-3- methylbutyrate
Chemical name (CA)	[(S)-(R*,R*)-Cyano(3-phenoxyphenyl)methyl-4-chloro-α- (1-methylethyl)benzeneacetate
CIPAC No	481
CAS No	66230-04-4
EEC No	----
FAO SPECIFICATION	Not available
Minimum purity	830 g/kg
Molecular formula	$C_{25}H_{22}ClNO_3$
Molecular mass	419.9
Structural formula	

Melting point	59.1 - 60.1 °C
Boiling point	> 360 °C
Appearance	White crystalline solid
Relative density	1.23 g/cm^3 at 26ºC
Vapour pressure	1.17 x 10^{-9} Pa at 20ºC (estimated) (99.9% pure)
Henry's law constant	4.92 x 10^{-4} Pa·m^3·mol^{-1}
Solubility in water	< 1µg/l (pH: 5.3) at 20 ºC pH: values at other pH not required pH:
Solubility in organic solvents	n-hexane: 26 g/l methanol: 82 g/l in most other organic solvents: > 500 g/l
Partition co-efficient (log P_{OW})	6.24 at 25 °C (pH not stated)
Hydrolytic stability (DT_{50})	pH 5: 129 d pH 7: limited hydrolysis pH 9: 65 d
Dissociation constant	No dissociation
Quantum yield of direct photo-transformation in water at ε >290 nm	ϕ = 6.8 x 10^{-3}
Flammability	Non-flammable
Explosive properties	Non- explosive
UV/VIS absorption (max.)	2.3·x 10^3 mol^{-1}·cm^{-1} at 278 nm > 10 mol^{-1}·cm^{-1}at 290 nm
Photostability (DT_{50})	10 d (sunlight), 6 d (artificial sunlight), in water

APPENDIX II

END POINTS AND RELATED INFORMATION

ESFENVALERATE

1 Toxicology and metabolism

Absorption, distribution, excretion and metabolism in mammals

Rate and extent of absorption:	*ca.* 90% in biliary study in rats
Distribution:	Widely
Potential for accumulation:	None
Rate and extent of excretion:	94 - 100 % excreted after 7 d
Toxicologically significant compounds:	None
Metabolism in animals:	20 metabolites, being formed by oxidation in the acid and alcohol parts of the molecule, cleavage of the ester linkage and conversion of the cyano group.

Acute toxicity

Rat LD_{50} oral:	88.5 mg/kg bw
Rat LD_{50} dermal:	> 5000 mg/kg bw
Rat LC_{50} inhalation:	480 - 570 mg/m^3
Skin irritation:	Non-irritant
Eye irritation:	Non-irritant
Skin sensitization (test method used and result):	Sensitizing**, M & K method.**

Short term toxicity

Target / critical effect:	Clinical (neurotoxic) symptoms
Lowest relevant oral NOAEL / NOEL:	5 mg/kg bw/day (oral 1 year, dog)
Lowest relevant dermal NOAEL / NOEL:	**1000 mg/kg bw/day (21 days, rabbit)**
Lowest relevant inhalation NOAEL / NOEL:	**Not relevant.**

Genotoxicity	Negative in *in vitro* and *in vivo* studies

Long term toxicity and carcinogenicity

Target / critical effect:	Reduction in body weight gain
Lowest relevant NOAEL:	**150 ppm ⇔ 7,5 mg/kg bw/day in rat with fenvalerate ⇔ 1,87 mg/kg bw/day esfenvalerate.**
Carcinogenicity:	Negative in studies with fenvalerate in mice **and rat.**

Reproductive toxicity

Target / critical effect - Reproduction:	**Reduced body weight gain in parental animals**
Lowest relevant reproductive NOAEL:	**2 mg/kg bw/day esfenvalerate.**
Target / critical effect - Developmental toxicity:	Maternal toxicity, neurotoxicity, reduced body weight gain and food consumption
Lowest relevant developmental NOAEL:	2 mg/kg bw/d esfenvalerate in rabbit

Delayed neurotoxicity	Some neurotoxic effects in rats at lethal doses in acute toxicity with esfenvalerate. **In a 3 months neurotoxicity study no irreversible neurotoxic effects (NOAEL = 3 mg/kg bw/day).**
Other toxicological studies	**None.**
Medical data	Skin symptoms and reactions like paraesthesia were observed as a result of exposure to the active substance; poisoning cases including accidental and occupational were reported.

Summary

	Value	Study	Safety factor
ADI:	0.02 mg/kg	Reproduction, esfenv., and long term fenval. in rat NOAEL – 2 mg/kg bw/day	SF=100
AOEL systemic:	0.018 mg/kg bw/day	Reproduction, rat, esfenv. NOEL - 2 mg/kg bw/d; correction for oral absorption 90%	SF=100
AOEL inhalation:	Not relevant	----	----
AOEL dermal:	Not relevant	----	----
ARfD (acute reference dose):	0,05	Acute oral rat and mouse, and acute neurotoxicity; NOAEL: 5 mg/kg bw/day	SF = 100

Dermal absorption

In vitro studies showed a dermal absorption of 0.6% in human epidermis and 44% in rat skin. Due to this difference, decided to take 10% for dermal absorption.

2 Fate and behaviour in the environment

2.1 Fate and behaviour in soil

Route of degradation

Aerobic:	13 soils: 6 Japanese soils: 2 (25 °C) + 4 (15 °C) 3 European soils at 20 °C 4 American soils at 25 °C ^{14}C-phenoxyphenyl; ^{14}C-benzylmethyne; ^{14}C-carbonyl; ^{14}C chlorophenyl
Mineralization after 100 days:	58.3 %; 82.4 %; 65.2 % (European soils at 50 % MWHC); 21.5 % (90 d)
Non-extractable residues after 100 days:	5.3 %; 3.3 %; 4.9 % (European soils at 50 % MWHC) 27.5 % (90 d) 35 % - 39.1 % (180 d)
Relevant metabolites above 10 % of applied active substance: name and/or code % of applied rate (range and maximum)	More than 7 metabolites formed in amounts < 10 % $CONH_2$-Fen reached up to 32 % AR (silty clay loam soil in USA after 12 months)

Supplemental studies

Anaerobic:	Study not submitted for esfenvalerate. ^{14}C-chlorophenylfenvalerate in 3 USA soils at 23 °C: 5 - 14 % non-extractable residues after 90 d 4 - 5.2 % CO_2 after 90 d Metabolites formed in amounts < 10 %
Soil photolysis:	2 Japanese soils exposed to natural sunlight for 30 d. In the dark: DT_{50} = 14 d; 64 d With light: DT_{50} = 1.1 d; 2.5 d $CONH_2$ - Esf. was found in light (48.4 %) Dark conditions (61 %) Other products < 10 %
Remarks:	Esfenvalerate is degraded by cleavage of the ester bond leading to alcohol and acid moieties, ring hydroxylation at the 4'-phenoxy position and hydration of the cyano group to an amide.

Rate of degradation

Laboratory studies	Method of calculation: Linear regression analysis 1st order kinetics; r^2 = 0.952 - 0.996
DT_{50}lab (20 °C, aerobic):	28 - 50 d 26.9 - 74 d (25 °C)
DT_{90}lab (20 °C, aerobic):	Not determined. It was not possible to determine the value in the period of examination.
DT_{50}lab (10 °C, aerobic):	39 - 179 d (15 °C); (least square method)
DT_{50}lab (20 °C, anaerobic):	Not determined. Extractable radioactivity: 60 - 74 % after 90 d

Field studies (USA and UK)	
DT_{50f} from soil dissipation studies: DT_{90f} from soil dissipation studies:	3 sites in USA - Multiple applications on cotton plants: Not possible to estimate DT_{50f} or DT_{90f} values due to low residue levels in soil 2 sites in UK – bare soil, Summer and Autumn applications estimated DT_{50f}: 62 - 126 d. after Summer appl. : 68 – 87 d. after Autumn appl. estimated DT_{90f}: 206 – 420 d. after Summer appl. : 227 – 291 d. after Autumn appl. (DT_{50f} mean values: 70 d. in sandy silt loam and 95 d. in clay soil after Summer application; 75 d. in sandy silt loam and 77 d. in clay soil after Autumn application) $CONH_2$ Esf. < 0.01 mg/kg in all field dissipation studies
Soil accumulation studies:	No studies have been submitted. No accumulation is expected
Soil residue studies:	6 Residue trials in Germany In 4 trials residues < 0.01 mg/kg In 2 trials residues 0.03 - 0.04 mg/kg (at 0 d) DT_{50f}: 33 - 35 d (1st order) DT_{90f}: 109 - 117 d (estimated)

Remarks	
e.g. effect of soil pH on degradation rate	The field dissipation studies in USA can be used for Southern part of EU. Residues not detected below 10 cm of soil layer.

Adsorption/desorption

K_f / K_{oc}:	By HPLC: Log K_{OC} 5.8 (5.3 - 6.6 for 95 % confidence ranges) r^2 for reference compounds = 0.93
K_d	For fenvalerate kd values: Sand (pH 4.8, 0.35% o.m.): 4.4 Sandy loam (pH n.d., 1.06% o.m.): 6.4 Silty clay loam (pH 6.4, 2.00% o.m.): 71.3 Sandy clay loam (pH 7.0, 1.50% o.m.): 104.8
pH dependence:	no pH dependence

Mobility

Laboratory studies:	No studies have been conducted with esfenvalerate, but only with fenvalerate.
Column leaching:	Fresh soils Less than 2 % AR in percolates. No identification has been done. The majority of AR was recovered from the top soil column and: > 98 % a.s. or 43 % a.s. and 38 % $CONH_2$-Fen.
Aged residue leaching:	Incubation 30 d Approximately 1 % AR in percolate of sandy loam soil. 92 % AR in the top soil column: > 90 % a.s. or 43 % a.s. and 35 % $CONH_2$-Fen

Field studies:

Lysimeter/Field leaching studies:	No studies have been submitted and are considered not necessary due to low mobility in soil from leaching studies

Remarks:	Although poor information has been submitted for esfenvalerate no mobility of this compound is expected as well as for the metabolites.

2.2 Fate and behaviour in water

Abiotic degradation

Hydrolytic degradation:	DT_{50} at pH 4/5: 192 d at 25 °C pH 7: not calculated due to variability of results pH 9: 65 d at 25 °C
Relevant metabolites:	Hydrolysis via cleavage of ester bond leading to CPIA
Photolytic degradation:	Natural sunlight at 25 °C: Distilled water: DT_{50}: 10 d Artificial sunlight: Sterilised water: DT_{50}: 6 d
Relevant metabolites:	Esfenvalerate stereoisomerized to RS and SR isomers. CPIA: 27 % by day 7

Biological degradation

Ready biological degradability:	Not submitted for esfenvalerate. For fenvalerate: No biological degradability
Water/sediment study:	1. Japanese pond and river sediment at 25 °C 2. UK natural aquatic systems at 10 °C
DT_{50} water:	DT_{50} (water): Esfenvalerate 30.3 % at time 0 Esfenvalerate 2.7 - 3.4 % at 100 d
DT_{90} water:	DT_{90} < 30 d
DT_{50} whole system:	DT_{50} (whole system): 54 - 80 d
DT_{90} whole system:	DT_{90} (whole system): 212 - 215 d
Distribution in water / sediment systems (active substance)	Esfenv. 26 – 27% at 100 d
Distribution in water / sediment systems (metabolites)	CPIA: 44 – 48% at 100 d Pbacid: 2 – 13% at 30 d
Accumulation in water and/or sediment:	Not necessary since esfenvenvalerate is not persistent in aquatic systems.

Degradation in the saturated zone	Not submitted. Not necessary.
Remarks:	No remarks

2.3 Fate and behaviour in air

Volatility

Vapour pressure:	1.17 x 10^{-9} Pa at 20ºC (estimated)
Henry's law constant:	4.92 x 10^{-4} Pa·m^3·mol^{-1} (calculated)

Photolytic degradation

Direct photolysis in air:	Not submitted.
Photochemical oxidative degradation in air DT_{50}:	$DT50_{air}$: 1.2 days (Atkinson method)
Volatilisation:	Not submitted

Remarks:	Esfenvalerate is considered non-persistent in air.

3 Ecotoxicology

Terrestrial Vertebrates

Acute toxicity to mammals:	LD_{50} = 7.9 mg a.s./kg bw (Rat - EC formulation)
Acute toxicity to birds:	LD_{50} = 1312 mg a.s./kg bw (Bobwhite quail)
Dietary toxicity to birds:	LC_{50} > 5000 ppm (Bobwhite quail/Mallard duck - fenvalerate)
Reproductive toxicity to birds:	NOEC: 125 ppm (Bobwhite quail – fenvalerate) 125 ppm (Mallard duck – fenvalerate)
Short term oral toxicity to mammals:	LD_{50} = 88.5 mg/kg bw (Rat – technical esfenvalerate)

Aquatic Organisms

Acute toxicity fish:	LC_{50} = 0.1 µg/l
Long term toxicity fish:	NOEC = 0.25 µg/l (mesocosm studies)
Bioaccumulation fish:	BCF: 2850 – 3650
Acute toxicity invertebrate:	EC_{50} = 0.9 µg/l
Chronic toxicity invertebrate:	NOEC = 0.052 µg/l; From mesocosm studies: EAC = 0.08 µg/l (overall conclusion from 3 mesocosm studies; long term effects were not observed for microcrustaceans); NOEC(community) = 0.01 µg/l (very slight effects)
Acute toxicity algae:	E_bC_{50} = 6.5 µg/l; E_rC_{50} = 10.0 µg/l
Chronic toxicity sediment dwelling organism:	Covered by mesocosm studies.

Honeybees

Acute oral toxicity:	0.21 µg a.s./bee (EC formulation)
Acute contact toxicity:	0.06 µg a.s./bee; 0.07 µg a.s./bee (EC formulation)
Semi-Field/Field studies:	Cage tests, tunnel cage tests and a field trial on oil seed rape were conducted. On the basis of the results it can be concluded that applications up to 30 g a.s./ha will not pose an unacceptable risk to honey bees. A high dose of 60 g a.s./ha was also tested with similar results concerning bee mortality of those observed with 15 and 30 g a.s./ha. Repellency was observed for 1 – 5 h, depending on the tested concentration.

Other arthropod species

Liniphiid spiders	Mortality: 100 % effects on adults (0.0125 kg a.s./ha, EC 50 g/l)
T.pyri (ext-lab)	overall effects(mortal./reprod.) of 10%, 48.8%, 46.3%, 58.9% and 90.7% resp. for 0.015, 0.027, 0.047, 0.084 and 0.15 g a.s./ha.
C. carnea	Mortality: 10 % effect on larvae (0.0125 kg a.s./ha, EC)
P. cupreus	Lethal/sublethal effects: 3.3 % in adults (0.0125 kg a.s./ha, EC)
Field study in cereals, summer application	EC form. 50 g s.a./l, two applications at 7.5 and 15 g s.a./ha. Transient and short lived effects on Lycosiidae, Hybotidae (Diptera) and Aphidiinae. No significant effects on Carabidae and Staphylinidae beatles. Recovery after three weeks.

Field study in Orchards (South of France), summer application	EC form. 50 g s.a./l; three applications at two week intervals at 1.5 (10% Max. Field Rate corresp. to drift at 5 m), 7.5 and 15 g s.a./ha (MFR). Observations before 1st application until 114DA3T. No treatment related effects on predatory mites or other beneficials at 1.5 g a.s./ha. At 7.5 g a.s./ha, 25 to 35% reduction of mite abundance was observed after treatments. Dose related effects were also observed on aphid predators and parasitoids. At 15 g a.s./ha 22 to 43% reduction of mite abundance was observed after treatments. Dose related effects were also observed on aphid predators and parasitoids. Other predators showed reduction only for this dose. Recovery was evident at 30DA3T for all species studied for both 7.5 and 15.0 g a.s./ha.

Earthworms

Acute toxicity:	212.5 mg formulation/kg substrate (10.6 mg a.s./kg substrate)
Reproductive toxicity:	No data submitted. No long term effects expected.

Soil micro-organisms

Nitrogen mineralization:	No permanent adverse effect up to 1.28 kg/ha
Dehydrogenase activity:	Considered acceptable test for assessing effects on biomass of soil microflora. No permanent adverse effect up to 1.28 kg/ha.

Appendix III

ESFENVALERATE

List of studies for which the main data submitter has claimed data protection and which during the re-evaluation process were considered as essential for the evaluation with a view to Annex I inclusion[7].

Annex point / Reference number	Author	Year	Title of study Source (where different from company) Company Report No GLP or GEP Status (where relevant) Published or not	Reports[8] on Previous use in granting national authorisations
IIA, 2.2	Kawashima, M	1994	Relative Density of Esfenvalerate. FLR 94-132 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLP-50-0049 non GLP, Unpublished	
IIA, 2.3.1	Wells, D. F	1998 b	Esfenvalerate Pure – Determination of Vapour Pressure. LLP-0074 Owner: Sumitomo Chemical Co., Ltd Sumitomo Ref No.: LLP-0073 GLP, Unpublished	
IIA, 2.3.2	Yoshimura, J	1998	Henry's law Constant for Esfenvalerate. LLP-0078 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLP-0078 GLP, Unpublished	
IIA, 2.4.1	Furuta, R.	1995 a	Color and Physical State of Esfenvalerate Pure Material. TA-95003 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLP-50-0051 non GLP, Unpublished	
IIA, 2.4.1	Furuta, R.	1995 b	Color and Physical State of Esfenvalerate Technical Grade. 2995 Owner: Sumitomo Chemical Co., Ltd.	

[7] List based on a detailed analysis from Portugal in its submission of 22 June 2000 (background document C)
[8] Reports received from Member States at the date of finalisation of the present review report (not exhaustive)

Annex point / Reference number	Author	Year	Title of study Source (where different from company) Company Report No GLP or GEP Status (where relevant) Published or not	Reports[8] on Previous use in granting national authorisations
			Sumitomo Ref No.: LLP-50-0057 GLP, Unpublished	
IIA, 2.4.2	Furuta, R.	1995c	Odor of Esfenvalerate Pure Material. TA-95004 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLP-50-0052 non GLP, Unpublished	
IIA, 2.4.2	Furuta, R.	1995d	Odor of Esfenvalerate Technical Grade. 2996 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLP-50-0058 GLP, Unpublished	
IIA, 2.5.1	Furuta, R.	1995e	Spectra of Esfenvalerate Pure Material. TA-95005 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLP-50-0053 non GLP, Unpublished	
IIA, 2.6	Kogovsek, L.M.	1997	Esfenvalerate - Water Solubility. LLP-0066 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLP- GLP, Unpublished	
IIA, 2.7	Kawashima, M	1994	Solubility of Esfenvalerate in Organic Solvents. FLR 94-133 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLP-50-0050 non GLP, Unpublished	
IIA, 2.8	Rohr, G.	1991b	Partition Coefficient Determination of Esfenvalerate (SAG 303) in n-Octanol/Water. 305212 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLP-11-0043 GLP, Unpublished	
IIA, 4.1	Furuta, R. Okumura, T	1995	Analytical Methods for the determination of Active Substance, Isomers and Impurities in Esfenvalerate Technical Grade	

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			2994 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLA-50-0067 GLP, Unpublished	
IIA, 4.1	Furuta, R.	1998	Linearity of the Analytical Method for the Determination of Esfenvalerate Technical Grade. LLA-0087 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLA-0087 GLP, Unpublished	
IIA, 4.2.1	Croucher, A.	1998 a	Esfenvalerate: Validation of an Analytical Method for the Determination of Residue in Potato. LLA-0081 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLA-0081 GLP, Unpublished	
IIA, 4.2.1	Croucher, A.	1998 b	Esfenvalerate: Validation of an Analytical Method for the Determination of Residue in Rapeseed and Rapeseed oil. LLA-0082 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLA-0082 GLP, Unpublished	
IIA, 4.2.1	Croucher, A.	1998 c	Esfenvalerate: Validation of an Analytical Method for the Determination of Residue in Hen Tissues. LLA-0083 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLA-0083 GLP, Unpublished	
IIA, 4.2.1	Croucher, A.	1998 d	Esfenvalerate: Validation of an Analytical Method for the Determination of Residue in Cattle Tissues. LLA-0084	

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			Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLA-0084 GLP, Unpublished	
IIA, 4.2.1	Barnard, G.	1997	The Validation of the Determination of Esfenvalerate Residues in Pea Matrices (Whole Pods, Dried Seeds and Shoots). LLA-0078 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLA-0078 GLP, Unpublished	
IIA, 4.2.4	Croucher, A.	1998 e	Esfenvalerate: Validation of an Analytical Method for the Determination of Residue in Air. LLA-0088 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLA-0088 GLP, Unpublished	
IIA, 5.1	Tomigahara, Y	1998	Billary Excretion of ^{14}C-Esfenvalerate in the Rat. LLP-0042 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLP-0042 GLP, Unpublished	
IIA, 5.3.3	MacKenzie, S. A.	1992	Repeated dose dermal toxicity: 21-day study with DPX-Y4306-90 (fenvalerate) in rabbits. HLR 127-92 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: AT-21-0472 GLP, Unpublished	
IIA, 5.5	Yamada, T.	1999	Hormonal Investigation for Rat Testicular Tumourigenicity Using Fenvalerate and Esfenvalerate. LLT-0190 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLT-0190 GLP, Unpublished	
IIA, 5.6	Higuchi, H.	1999	Reproduction Study in Rats with Esfenvalerate (in pelleted diet).	

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			LLT-0192 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLT-0192 GLP, Unpublished	
IIA, 5.6.1	Biegel, L. B	1994	Reproductive and fertility effects with DPX-YB656-84 multigeneration reproduction study in rats. HLR 331-94 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLT-41-0169 GLP, Unpublished	
IIA, 5.6.2	Murray, M.A.	1994 a	Pilot developmental toxicity study of DPX-YB656-84 in rats. HLR 36-94 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLT-41-0167 GLP, Unpublished	
IIA, 5.6.2	Nemec, M.D	1991 a	A developmental toxicity study of S-1844 in rats. WIL-118010 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLT-11-0143 GLP, Unpublished	
IIA, 5.6.2	Murray, M.A.	1994 b	Pilot developmental toxicity study of DPX-YB656-84 in rabbits. HLR 43-94 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLT-41-0168 GLP, Unpublished	
IIA, 5.6.2	Nemec, M.D	1991 b	A developmental toxicity study of S-1844 in rabbits. WIL-118013 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLT-01-0135 GLP, Unpublished	
IIA, 5.7	Beyrouty, P.	1999	A 13-Week Dietary Neurotoxicity Study of Esfenvalerate TG in the Rat. LLT-0189 Owner: Sumitomo Chemical Co., Ltd.	

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			Sumitomo Ref No.: LLT-0189 GLP, Unpublished	
IIA, 6.6	Fan, H.Y., Lee, P.W.		A 30, 60 and 120-day rotation crop study using carbon-14 labelled-chorophenyl- and phenoxyphenyl-SD 43775. TIR-22-004-80 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: AM-01-0122 non GLP, Unpublished	
IIA, 6.6	Lee, P.W., Stearns, S.M., Powell, W.R.	1982	A 30, 60 and 120-day rotation crop study using ^{14}C-SD 43775 following a single soil treatment at a dosage rate of 2 lb a.i./acre. RIR-22-004-82 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: AM-21-0152 non GLP, Unpublished	
IIA, 7.1.1.1.1	Itoh, K., Kodaka, R., Kumada, K., Nambu, K., Kato, T.	1995	Aerobic soil metabolism of esfenvalerate and fenvalerate in European soils. S019300A Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLM-50-0039 GLP, Unpublished	
IIA, 8.3.1.2	Petto, R.	1994	Study On The Effects Of Sumicidin Alpha SC (SAG 30301) On Honey Bee Brood (*Apis mellifera* L.) (Hymenoptera, Apidae) 432000 Owner: Sumitomo Chemical Co., Ltd. Sumitomo Ref No.: LLW-41-0072 GLP, Unpublished	
IIA, 8.3.2	Goβmann, A	1998	Effects of esfenvalerate 5EC on the predatory mite *Typhloromus pyri* Scheuten (Acari, Phytoseiidae) – extended laboratory study Report No: 3151061 Owner: Sumitomo Chemical Co. Ltd. Sumitomo Ref No.: LLW-0092	

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			GLP, Unpublished	
IIA, 8.3.2	Goβmann, A	2000 a	Effects of esfenvalerate 5EC on the predatory mite *Typhlodromus pyri* Scheuten (Acari, Phytoseiidae) – extended laboratory study on residues Report No.: 3152062 Owner: Sumitomo Chemical Co. Ltd. Sumitomo Ref No.: LLW-0095 GLP, Unpublished	
IIA, 8.3.2	Goβmann, A	2000 b	Effects of Sumi-alpha 5EC on predatory mite (Acari, phytoseiidae) and other beneficial arthropods in apple orchards (field experiment in southern France) Report No.: 3152064 Owner: Sumitomo Chemical Co. Ltd. Sumitomo Ref. No.: LLW-0096 GLP, Unpublished	
IIA, 8.3.2	Vinall, S., Mead-Briggs, M	1999	A field study to evaluate the effects of the insecticide Sumi-alpha, an EC formulation containing 50 g/l esfenvalerate, on the non-target arthropod fauna of winter wheat. Report No.: SUM-98-1 Owner: Sumitomo Chemical Co. Ltd Sumitomo Ref No.: LLW-0093 GLP, Unpublished	