Conclusion regarding the peer review of the pesticide risk assessment of the active substance

fenitrothion

finalised: 13 January 2006

SUMMARY

Fenitrothion is one of the 52 substances of the second stage of the review programme covered by Commission Regulation (EC) No 451/2000[1], as amended by Commission Regulation (EC) No 1490/2002[2]. This Regulation requires the European Food Safety Authority (EFSA) to organise a peer review of the initial evaluation, i.e. the draft assessment report (DAR), provided by the designated rapporteur Member State and to provide within one year a conclusion on the risk assessment to the EU-Commission.

United Kingdom being the designated rapporteur Member State submitted the DAR on fenitrothion in accordance with the provisions of Article 8(1) of the amended Regulation (EC) No 451/2000, which was received by the EFSA on 4 November 2003. Following a quality check on the DAR, the peer review was initiated on 24 November 2003 by dispatching the DAR for consultation of the Member States and the sole applicant Sumitomo Chemical Agro Europe S.A. Subsequently, the comments received on the DAR were examined by the rapporteur Member State and the need for additional data was agreed in an evaluation meeting in July 2004. Remaining issues as well as further data made available by the applicant upon request were evaluated in a series of scientific meetings with Member State experts in January – March 2005.

A final discussion of the outcome of the consultation of experts took place with representatives from the Member States on 28 November 2005 leading to the conclusions as laid down in this report.

The conclusion was reached on the basis of the evaluation of the representative uses as insecticide as proposed by the applicant which comprises broadcast spraying in tomato and grapevine at application rates up to 750 g per hectare. Fenitrothion can be used only as insecticide.
The representative formulated product for the evaluation was "IPM 400", a capsule suspension concentrate (CS), registered under different trade names in southern Member States of the EU.

[1] OJ No L 53, 29.02.2000, p. 25
[2] OJ No L 224, 21.08.2002, p. 25

Adequate methods are available to monitor all compounds given in the respective residue definition. Residues in food of plant origin can be determined with a multi-method (The German S19 method has been validated). For the other matrices only single methods are available to determine residues of fenitrothion.
Sufficient analytical methods as well as methods and data relating to physical, chemical and technical properties are available to ensure that quality control measurements of the plant protection product are possible.

Fenitrothion (FNT) is rapidly and almost completely absorbed. It is mainly distributed to the liver, blood and carcass. Elimination is very rapid. The main metabolites are the phosphate fenitrothion (FNO), the mono methyl analogues of FNT and FNO (DM-FNT and DM-FNO respectively) and 3-methyl-4-nitrophenol (NMC) and its corresponding sulphate and glucuronide.
The oral LD_{50} is 330-1700 mg/kg bw. The dermal LD_{50} is 890 mg/kg bw, therefore the classification R21 (Harmful in contact with the skin), is proposed. FNT acute inhalatory toxicity is low. FNT is not a skin or an eye irritant in rabbits, but it is a skin sensitiser. Therefore, the classification R43 (May cause sensitisation in contact with the skin), is proposed.
The critical effect is decreased erythrocyte and brain cholinesterase. The relevant short term toxicity NOAEL is 1.32 mg/kg bw/day from the 90-day study in rats.
No evidence of delayed neurotoxicity was found in hens following acute and subacute exposures.
The Acceptable Daily Intake (ADI) is 0.005 mg/kg bw/day, the Acceptable Operator Exposure Level (AOEL) and the Acute Reference Dose (ARfD) are 0.013 mg/kg bw/day, with a safety factor (SF) of 100. The estimated operator exposure in grapes exceeds the AOEL, as well as re-entry exposure estimates for workers not wearing PPE. In outdoor tomatoes: the estimated operator exposure is below the AOEL only for field crop spraying with the use of PPE; re-entry exposure estimates for workers not wearing PPE exceed the AOEL. A biomonitoring study in greenhouse tomatoes not fully representative of the intended uses showed exposure below the AOEL (maximum 25%). The exposure to harvesters without PPE would be acceptable. Exposure estimates for general re-entry activities exceed the AOEL for workers not wearing PPE.

Metabolism studies of fenitrothion in tomatoes and grapes indicate that the major metabolic pathway proceeds through the hydrolysis of the compound leading to 3-methyl-4-nitrophenol and dimethylphosphorothioic acid. 3-methyl-4-nitrophenol is further conjugated and has no anticholinesterase activity. Due to the labelling position, the fate of dimethylphosphorothioic acid was not further investigated. Another minor pathway consists in O-demethylation of fenitrothion leading to desmethylfenitrothion. The proposed residue definition for monitoring and risk assessment is fenitrothion only. However the possible contribution of desmethylfenitrothion and dimethylphosphorothioic acid to the toxicological burden is not known and should be investigated before the residue definition for risk assessment can be finalised.
Sufficient supervised residue trials were submitted in accordance with the representative uses and supporting the establishment of MRLs at 3 and 0.1 mg/kg in grapes (table and wine grapes) and tomatoes respectively. The behaviour of residues through processing was investigated and it was

shown that fenitrothion is degraded into desmethylfenitrothion under hydrolysis conditions. Low transfer factors of fenitrothion were calculated for the processing to grape juice, wine, tomato puree and tomato juice.
Metabolism studies in livestock were submitted although not required as the representative uses do not imply animal exposure to residues of fenitrothion through feedingstuffs. These studies were not sufficient to build a complete picture of the nature of the residues to be expected in all animal commodities.
Acute and chronic risk assessments have been carried out taking into account fenitrothion residues only. These assessments have demonstrated a potential for acute risk for the consumer resulting from the consumption of treated table grapes. For the other commodities, although the exposure to fenitrothion residues is below the trigger toxicological values, a robust conclusion is not possible at this stage, given the lack of information on the toxicological relevance and the actual levels in commodities of desmethylfenitrothion and dimethylphosphorothioic acid.

In soil under dark aerobic conditions fenitrothion yields the major metabolite NMC. Substantial formation of unextractable residues and mineralization was observed. Under dark anaerobic conditions AM-FNT and AA-FNT were found to be the major metabolites.
Photolysis in soil is unlikely to contribute to the environmental degradation of fenitrothion.
Fenitrothion is low persistent in soil under aerobic conditions when applied directly or formulated as and emulsifiable concentrate (EC). Half life is significantly longer for the encapsulated formulation proposed for the representative uses (CS: $DT_{50\ lab\ CS}$ = 82.3 d). Additional laboratory and field dissipation studies with the CS formulation were required and have been presented but have not been evaluated by the RMS. The experts' meeting agreed to propose a restriction to use only in green houses until the data requirements for the CS formulation are fulfilled.
The major metabolite NMC is low persistent in soil under aerobic conditions ($DT_{50\ lab\ 20\ °C}$ = 2.8 -3.3 d).
PECs in soil presented in the DAR can not be regarded as worst case. Therefore, risk assessment for the EU representative uses may not be considered concluded and reassessment will be necessary once the data requirement for further soil studies with the CS formulation is fulfilled.
Fenitrothion is medium mobile (K_{oc} = 252- 384 mL / g) and NMC is medium mobile (K_{foc} = 270-303 mL / g) in soil.
Fenitrothion shows a slow hydrolytic degradation. The release rate of the CS formulation was investigated in sterile aqueous buffer solutions. It is reasonable to expect that the further soil studies already required for the CS formulation will provide additional information on the release rate of fenitrothion in soil.
Photolysis may contribute to the environmental degradation of fenitrothion in water. However, this contribution is deemed to be low for the fenitrothion applied as an encapsulated formulation.
Fenitrothion is not readily biodegradable in water.
In water-sediment systems fenitrothion (pure active substance) dissipated rapidly from the water phase. NMC, AM-FNT, Unk 2 (tentatively identified as DM-AM-FNT), Unk 6 (tentatively identified as A-NMC and considered an analytical artefact of NMC) were the major metabolites in the water

phase. In the sediment phase only NMC was measured at levels above 10 % of AR. All metabolites declined to very low levels until the end of the study. Most of the applied radioactivity accumulated in the NER fraction of the sediment that undergoes slow further mineralization with CO_2 release.
An aerobic water-sediment study compares the degradation of fenitrothion applied as the CS formulation with an EC formulation. When applied as CS formulation the capsules tend to settle in the sediment phase. The DT_{50} for the CS formulated fenitrothion was beyond the duration of the study and estimated to be 84 – 97 days for the whole system.
The PEC_{SW} and PEC_{SED} were calculated for the field uses with spray drift as the only entry route into surface water. PEC_{SW} values were also provided for the metabolites AM-FNT, DM-AM-FNT and NMC. These $PEC_{SW/SED}$ may need to be revised on basis of new information on the release rate. The applicant submitted PEC_{SW} / PEC_{SED} calculation for the use in glasshouses based on the Netherlands scheme. However, this calculation was not evaluated by the RMS which proposed a non exposure situation for this use. Experts' meeting concluded that potential surface water contamination arising from glasshouse representative use needs to be assessed taking also into account the high potential risk to aquatic organisms and the potential for volatilization (see chapter 5.2.). However, the difficulties to perform this risk assessment at this stage, due to the lack of EU agreed procedure, were recognized by the meeting.
On basis of the FOCUS ground water calculations, concentrations of fenitrothion and the metabolite NMC were not expected to exceed 0.1 µg / L in ground water, irrespective to the release rate from the capsules ($DT_{50\ release}$ = 0 – 250 d were simulated).
According the Henry Law constant there is some potential for volatilization of fenitrothion. The use as a microencapsulated formulation will reduce this potential for volatilization. Furthermore, half life in air was calculated to be 6 h indicating that long range transport is not likely.

The acute, short-term and the long-term risk to birds and the long term risk to mammals from uptake of contaminated food items was assessed as high from the representative outdoor uses (tomato and grapevine). Consequently further risk refinement steps are necessary to address the risk to birds and mammals. A high long term risk to birds and mammals was identified from the uptake of contaminated earthworms. The applicant submitted new information on the risk to birds and mammals from fenitrothion residues in earthworms and further information to address the risk of secondary poisoning from consumption of contaminated fish and a statement on the risk from uptake of contaminated drinking water. This new information was not evaluated by the RMS.
Daphnia magna was the most sensitive tested aquatic species. A high acute and chronic risk from the representative outdoor uses was identified. The relevant acute Annex VI TER trigger values are exceeded only if buffer zones of 200 m (tomato) and 175 m (grapevine) are taken into account. However, even with buffer zones as large as 250 m the chronic TER values are still below the Annex VI trigger value of 10. The applicant submitted a risk assessment based on the Netherlands scheme for calculating emissions from greenhouses. This risk assessment was not evaluated by the RMS. Instead a no exposure situation was proposed. The Experts´ meeting agreed that PECsw water calculations for the greenhouse use are needed. A final conclusion on the risk to aquatic organisms from the representative use in greenhouses cannot be drawn. However, taking into account the very

high toxicity to daphnids, a high risk to aquatic organisms from the greenhouse use cannot be excluded if exposure of aquatic organisms from greenhouse use is possible. The acute risk of the major metabolites in the water-sediment system, NMC and AM-FNT were assessed as low. Testing with the metabolite DM-AM-FNT was considered as not necessary because it is very unstable and the precursor AM-FNT is three orders of magnitude less toxic than fenitrothion. A mesocosm study was submitted by the applicant prior to the Experts´ meeting to refine the risk to aquatic invertebrates. The mesocosm study was not evaluated by the RMS because it was considered as not relevant by the RMS for the greenhouse use.

A high risk to bees was shown from oral and contact exposure to fenitrothion (technical) and for contact toxicity of the formulation IPM 400 CS. Higher tier studies with bees were available. However, the studies were conducted for other uses than the representative uses. It was not clear whether the available studies address the risk from the representative uses in tomato and grapevine. Therefore a high risk to bees from the representative outdoor uses cannot be excluded. Risk mitigation measures like labelling were suggested by the RMS. It was agreed at the EPCO Experts` meeting that risk mitigation measures for pollinating insects have to be set at MS level for the representative use in greenhouses.

Higher tier tests were conducted to address the risk to non-target arthropods. Freshly dried residues of an application of IPM 400 at a dose rate similar to the GAP led to significant mortality in the tested non-target arthropods. *Aphidius rhopalosiphi* was the most sensitive species. No significant effects on mortality or fecundity of *A. rhopalosiphi* were observed in tests with 42 d aged residues showing the potential of recolonisation. An elaborated risk assessment for the off-field risk from the representative outdoor uses (tomato and grapevine) to non-target arthropods is considered necessary. A final conclusion on the risk to non-target arthropods from the outdoor use can be drawn when the off-field risk assessment is made available. Because of the high toxicity to non-target arthropods the meeting proposed a labelling for the greenhouse use to protect species which are used for biological pest control.

The acute risk to earthworms was assessed to be low but the long-term risk to earthworms was assessed as high. Further information to address the long-term risk to earthworms was submitted by the applicant in September 2004 but not evaluated by the RMS. The chronic risk from the soil metabolite NMC posed to earthworms is considered to be low.

No information was available on the toxicity of fenitrothion to other soil non-target organisms. Fenitrothion is formulated as a slow release micro-capsule and the DT_{90}lab for the formulation was estimated to be 283 days. A high long term risk was observed for earthworms and for non-target arthropods in the higher tier studies. Therefore a data requirement was set by the RMS to address the risk to other soil non-target macro-organisms. Further information to address the risk to soil non-target macro-organisms was submitted by the applicant in September 2004 but was not evaluated by the RMS. The risk from fenitrothion from the representative uses to soil non-target micro-organisms was assessed to be low. Further information submitted by the applicant to address the risk of the soil metabolite NMC was not evaluated by the RMS. Therefore a final conclusion on the risk of the soil metabolite NMC to soil non-target micro-organisms cannot be drawn.

The risk of fenitrothion to other non-target organisms (flora) and biological methods of biological sewage treatment is considered to be low.
Further data/information to address the risk from the outdoor uses to birds and mammals, aquatic organisms, non-target arthropods, earthworms, soil non-target macro-organisms, soil non-target micro-organisms was submitted prior to the EPCO Experts´ meeting. This data/information was not evaluated by the RMS and no further risk assessment was conducted. As far as the risk from the representative outdoor uses was assessed (not taking into account the new information/data and further risk refinement steps) it is preliminary concluded that the outdoor uses pose a high risk to birds and mammals, aquatic organisms, bees, non-target arthropods, earthworms, soil non-target macro-organisms and soil-non target micro-organisms. The risk from the greenhouse use (provided it is a permanent construction and no natural soil is used) posed to birds and mammals, earthworms, soil non-target macro-organisms and soil non-target micro-organisms is considered to be low. Risk mitigation measures are suggested for the greenhouse use for pollinating insects, non-target arthropods (species used in biological pest control). A risk assessment for aquatic organisms should be conducted for the representative use in greenhouses at Member State level.

Key words: fenitrothion, peer review, risk assessment, pesticide, insecticide

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BACKGROUND

Commission Regulation (EC) No 451/2000 laying down the detailed rules for the implementation of the second and third stages of the work program referred to in Article 8(2) of Council Directive 91/414/EEC, as amended by Commission Regulation (EC) No 1490/2002, regulates for the European Food Safety Authority (EFSA) the procedure of evaluation of the draft assessment reports provided by the designated rapporteur Member State. Fenitrothion is one of the 52 substances of the second stage covered by the amended Regulation (EC) No 451/2000 designating United Kingdom as rapporteur Member State.

In accordance with the provisions of Article 8(1) of the amended Regulation (EC) No 451/2000, United Kingdom submitted the report of its initial evaluation of the dossier on fenitrothion, hereafter referred to as the draft assessment report, to the EFSA on 4 November 2003. Following an administrative evaluation, the EFSA communicated to the rapporteur Member State some comments regarding the format and/or recommendations for editorial revisions and the rapporteur Member State submitted a revised version of the draft assessment report. In accordance with Article 8(5) of the amended Regulation (EC) No 451/2000 the revised version of the draft assessment report was distributed for consultation on 24 November 2003 to the Member States and the main applicant Sumitomo Chemical Agro Europe S.A. as identified by the rapporteur Member State.

The comments received on the draft assessment report were evaluated and addressed by the rapporteur Member State. Based on this evaluation, representatives from Member States identified and agreed in an evaluation meeting on 13 July 2004 on data requirements to be addressed by the applicant as well as issues for further detailed discussion at expert level. A representative of the applicant was attending this meeting.

Taking into account the information received from the applicant addressing the request for further data, a scientific discussion of the identified data requirements and/or issues took place in expert meetings organised on behalf of the EFSA by the EPCO-Team at the Federal Office for Consumer Protection and Food Safety (BVL) in Braunschweig in January – March 2005. The reports of these meetings have been made available to the Member States electronically.

A final discussion of the outcome of the consultation of experts took place with representatives from Member States on 28 November 2005 leading to the conclusions as laid down in this report.

During the peer review of the draft assessment report and the consultation of technical experts no critical issues were identified for consultation of the Scientific Panel on Plant Health, Plant Protection Products and their Residues (PPR).

In accordance with Article 8(7) of the amended Regulation (EC) No 451/2000, this conclusion summarises the results of the peer review on the active substance and the representative formulation

evaluated as finalised at the end of the examination period provided for by the same Article. A list of the relevant end points for the active substance as well as the formulation is provided in appendix 1.

The documentation developed during the peer review was compiled as a **peer review report** comprising of the documents summarising and addressing the comments received on the initial evaluation provided in the rapporteur Member State's draft assessment report:

- the comments received
- the resulting reporting table (rev. 1-1 14 July 2004)
- the consultation report

as well as the documents summarising the follow-up of the issues identified as finalised at the end of the commenting period:

- the reports of the scientific expert consultation
- the evaluation table (rev. 1-2 of 8 December 2005)

Given the importance of the draft assessment report including its addendum (compiled version of November 2005 containing all individually submitted addenda) and the peer review report with respect to the examination of the active substance, both documents are considered respectively as background documents A and B to this conclusion.

By the time of the presentation of this conclusion to the EU-Commission, the rapporteur Member State has made available amended parts of the draft assessment report which take into account mostly editorial changes. Since these revised documents still contain confidential information, the documents cannot be made publicly available. However, the information given can basically be found in the original draft assessment report together with the peer review report which both is publicly available.

THE ACTIVE SUBSTANCE AND THE FORMULATED PRODUCT

Fenitrothion is the ISO common name for *O,O*-dimethyl *O*-4-nitro-*m*-tolyl phosphorothioate (IUPAC).

Fenitrothion belongs to the class of phenoyl organothiophosphate insecticides such as fenthion and parathion. Fenitrothion is taken up orally and dermally in target pests and is a cholinesterase inhibitor.

The representative formulated product for the evaluation was "IPM 400", a capsule suspension concentrate (CS), registered under different trade names in southern Member States of the EU.

The evaluated representative uses as insecticide comprise broadcast spraying to control insects such as *aphids*, *helicoverpa*, *metcalfa* and *lobesia* in tomato and grapevine, respectively, at application rates up to 750 g per hectare. Fenitrothion can be used only as insecticide.

SPECIFIC CONCLUSIONS OF THE EVALUATION

1. Identity, physical/chemical/technical properties and methods of analysis

The minimum purity of fenitrothion as manufactured should not be less than 930 g/kg, which is higher than the minimum purity given in the FAO specification 35/TC/S (1988) of 910 g/kg. The higher value relates to the submitted results of current batch analysis and not to any toxicological concern to increase the minimum purity.

The technical material contains *S*-methyl fenitrothion[3], which has to be regarded as relevant impurity. The maximum content in the technical material should not be higher than 5 g/kg, which is lower than the given maximum content in the FAO specification (20 g/kg; 35/TC/S, 1998). The lower value relates also to the submitted results of current batch analysis and not to any toxicological concern to decrease the maximum content.

Moreover, fenitrothion shows according the EEC method A14 explosive properties with respect to thermal sensitivity. Therefore, fenitrothion should be classified as *E* (explosive).

The content of fenitrothion in the representative formulation is 400 g/L (pure).
At the moment no FAO specification exists for a CS formulation. A potentially proposed maximum limit for *S*-methyl fenitrothion is still under discussion. However, a new shelf-life study is required to provide data on the levels of *S*-methyl fenitrothion in the stored formulation (using a "fresh" sample).

Beside this, the assessment of the data package revealed no particular area of concern in respect of the identity, physical, chemical and technical properties of fenitrothion or the respective formulation.

The main data regarding the identity of fenitrothion and its physical and chemical properties are given in appendix 1.

Sufficient test methods and data relating to physical, chemical and technical properties are available. Also adequate analytical methods are available for the determination of fenitrothion in the technical material and in the representative formulation as well as for the determination of the respective impurities in the technical material and the relevant impurity in the representative formulation.
Therefore, enough data are available to ensure that quality control measurements of the plant protection product are possible.

Adequate methods are available to monitor all compounds given in the respective residue definition, i.e. fenitrothion in food of plant origin; fenitrothion in soil; fenitrothion, in water and air.

[3] In the FAO specification *S*-ethyl fenitrothion is mentioned. That this is a typing error was confirmed by Gero Vaagt (Senior Officer, Pesticide Management Group, Plant Production and Protection Division, Food and Agriculture Organization of the United Nations).

In the case that the metabolite NMC (3-methyl-4-nitrophenol) is included in the residue definition for soil, an analytical method is required.
Residues in food of plant origin can be determined with a multi-method (The German S19 method has been validated). For the other matrices only single methods are available to determine residues of fenitrothion. The methodology used is GC with MS or PN detection.
An analytical method for food of animal origin is not required due to the fact that no residue definition is proposed (see 3.2).

The discussion in the expert meeting (EPCO 20, March 2005) on identity, physical and chemical properties and analytical methods was limited to the specification of the technical material and the representative formulation as well as to analytical methods (enforcement methods as well as for the technical material and the formulation).
The acceptability of the GC-method submitted for the determination of *S*-methyl fenitrothion in the representative formulation was under discussion after the expert meeting in a written procedure. The method was accepted by the majority of the participants. However, a minority had fundamental concerns with the method. The main issue is the small gap between the proposed injector temperature and the boiling point of the used solvent. Furthermore, it seems that also surface catalysed *S*-rearrangement and degradation processes are important. Both are difficult to control.
Therefore, these experts support the idea to develop a new or adopt the existing HPLC method for the determination of *S*-methyl fenitrothion in CS formulation.

2. Mammalian toxicology

Fenitrothion (FNT) was discussed at EPCO experts' meeting for mammalian toxicology (EPCO 18) in February 2005.

2.1 ABSORPTION, DISTRIBUTION, EXCRETION AND METABOLISM (TOXICOKINETICS)

Fenitrothion is rapidly and almost completely absorbed (>90% in 48 hours; after 7 days absorption is almost complete). It has no potential for accumulation. Within 7 days from administration it is mainly distributed to the liver, blood and carcass (for both low and high doses). Elimination is very rapid (about 90% of the administered dose is eliminated in excreta within 48 hours). The main metabolites are the phosphate fenitrothion (FNO), the mono methyl analogues of FNT and FNO (DM-FNT and DM-FNO respectively) and 3-methyl-4-nitrophenol (NMC) and its corresponding sulphate and glucuronide. No FNT is found in urine. Small amounts of FNT are found in faeces after a single high dose administration. In the rat, reactions leading to biotransformation are the desmethylation of one of the P-O methyl group, cleavage of the P-O aryl linkage and conjugation of the resulting phenol (as sulphate and glucuronide).

2.2 ACUTE TOXICITY

The oral LD_{50} in rats of FNT diluted in 10% Tween solvent is 330 and 800 mg/kg bw in males and females, respectively, while for the undiluted FNT the oral LD_{50} is 1700 and 1720 mg/kg bw in males and females, respectively. The dermal LD_{50} is 890 and 1200 mg/kg bw (males – females), therefore the **classification R21 "Harmful in contact with the skin", is proposed**. FNT acute inhalatory toxicity is low (LC_{50} is >2.210 mg/L). FNT is not a skin or an eye irritant in rabbits, but it is a skin sensitiser. Therefore, the **classification R43 "May cause sensitisation in contact with the skin", is proposed.**

2.3 SHORT TERM TOXICITY

Toxicity of FNT after short term repeated exposures has been tested in a 6-month and a 90-day oral study in rats, in a 1-year oral study in dogs and in a 21-day dermal study in rats. Target effect of FNT is acetylcholinesterase inhibition.

The relevant short term toxicity NOAEL is 1.32 mg/kg bw/day from the 90-day study in rats, based on decreased body weight and reduction in erythrocyte and brain cholinesterase at 3.99 mg/kg bw/day.

2.4 GENOTOXICITY

FNT was tested in a number of *in vivo* and *in vitro* tests (purity ranging from 94.3 to 98.6%); it was not mutagenic in any of the *in vivo* tests, and showed a positive result only in Salmonella Typhimurium TA100 strain in bacterial reverse mutation tests, but not in nitroreductase-defective strain of TA100. This finding shows a specificity to the bacterial strain and that the bacterial nitroreductase activity is necessary for FNT to express mutagenicity in TA100 strain.

Based on these considerations, it can be concluded that FNT does not have genotoxic potential.

2.5 LONG TERM TOXICITY

Chronic toxicity and carcinogenicity of FNT have been assessed in rats (92-week oral and 2-year oral studies) and mice (2-year oral study). A target effect of all the investigations was the inhibition of acetylcholinesterase activity. There was no evidence of carcinogenic potential in any of the studies.

The relevant NOAEL is 0.5 mg/kg bw/day from the 2-year study in rats, based on significant erythrocyte and brain cholinesterase inhibition at 1.5 mg/kg bw/day.

2.6 REPRODUCTIVE TOXICITY

Reproductive toxicity from FNT has been assessed in a multigeneration study in rats, in 3 developmental toxicity studies (2 in rats, 1 in rabbits) plus a supplementary study (Herschberger assay in rats).

The relevant NOAEL for parental toxicity is 0.7 mg/kg bw/day, based on alterations in body weight gain and food consumption at 3.1 mg/kg bw/day, which represents the NOAEL for reproductive and offspring toxicity, based on reduced pup weight, viability and lactation at higher doses.

The relevant maternal NOAEL in the developmental toxicity studies is 10 mg/kg bw/day (rabbit), based on abortions and clinical toxicity at 30 mg/kg bw/day. This dose was considered to be the NOAEL for foetotoxicity: although it was responsible for the increased incidence of deaths in dams, this did not otherwise affect foetal development.

A Herschberger assay in rats was submitted to investigate possible interferences of FNT with androgen-receptor mediated mechanisms, which was not confirmed by the test. FNT failed to show a hormonal-like activity.

2.7 NEUROTOXICITY

Being an organophosphate, fenitrothion was studied to asses the potential for delayed neurotoxicity. No evidence was found in hens following acute and subacute exposures.

2.8 FURTHER STUDIES

Toxicity of FNO and 3-methyl-4-nitrophenol (NMC) was assessed in a 6-month study in rats.

The NOAEL for FNO was 0.91 and 0.99 mg/kg bw/day (for males and females, respectively), based on significant decrease of brain and erythrocyte cholinesterase activity at higher doses; the NOAEL for NMC was 94.7 and 101 mg/kg bw/day (males - females), highest tested dose. The oral LD_{50} of FNO was found to be 24 mg/kg bw in rats and 90 mg/kg bw in mice.

2.9 MEDICAL DATA

Medical examination of factory workers has not shown any treatment-related effects. Very limited information was provided for clinical cases and poisoning incidents and no information was provided for general population and epidemiological studies.

2.10 ACCEPTABLE DAILY INTAKE (ADI), ACCEPTABLE OPERATOR EXPOSURE LEVEL (AOEL) and ACUTE REFERENCE DOSE (ARfD)

ADI

The ADI for fenitrothion is 0.005 mg/kg bw/day, based on the NOAEL of 0.5 mg/kg bw/day from the 2-year study in rat, with a SF of 100.

AOEL

The AOEL is 0.013 mg/kg bw/day from the 90-day oral study in rats with a SF 100.

ARfD

In the DAR the RMS proposed to derive the ARfD from a human study showing no effects, even ChE inhibition, at 0.36 mg/kg bw/day (highest dose tested), consisting in two single doses of 0.18 mg/kg bw/day each. Therefore the proposed value was 0.018 applying a SF 10 (only intraspecies variability was considered).

The scientific value of the study was discussed and considered limited by the experts. A suitable study for setting an ARfD was considered to be the 90-day rat study. The new value the experts agreed on was 0.013 mg/kg bw/day (NOAEL 1.3 mg/kg bw:day, SF 100).

2.11 DERMAL ABSORPTION

During the meeting, the default values of 10-100% proposed in the DAR were discussed. The experts agreed on dermal absorption values of 3.9% for the concentrate and 20.9% for the dilution of the microencapsulated formulation, based on a new *in vitro* dermal absorption study summarised in the Addendum.

2.12 EXPOSURE TO OPERATORS, WORKERS AND BYSTANDERS

Operator exposure

Fenitrothion representative product IPM 400 is intended to be used on grapevines (table and wine) and in tomatoes (outdoor and greenhouse uses). The maximum application rate is 0.75 kg fenitrothion/ha.

For tomatoes grown in greenhouses and outdoor table grapes the proposed application is using hand-held equipment with hydraulic nozzles. For wine grapes the proposed method is application using tractor-drawn air blast sprayers and for field grown tomatoes tractor, mounted boom hydraulic nozzles.

Outdoor uses

Estimates of operator exposure were made according to the German model and the UK POEM. Further refinements have been provided based on field biomonitoring studies and new dermal absorption values agreed on during the experts' meeting.

DAR:

All the outdoor proposed scenarios exceeded the systemic AOEL of 0.013 mg/kg bw/day (with a dermal absorption value of 100%), even with the use of PPE, both with the German model or the UK POEM.

Two biomonitoring field studies in grapes have been considered in order to refine the assessment for outdoor crops. They showed some weaknesses and concerns with regard to the applicability to risk assessment. Both of them have been conducted with a low number of workers dealing with different activities. The use of PPE during application was not standardised; the application rate considered was lower than the proposed one, the in-use concentration was 2.5x less than the maximum proposed; the number of hectares treated low if compared to standard assumptions. Exposure was assessed through the determination of the urine levels of 3-methyl-4-nitrophenol, accounting for a bioconversion factor from fenitrothion to the metabolite of 80%. The monitoring period ranged from 72 to 120 hours.

The assessment showed the exceedence of the AOEL for all the operators in one case and in 4 out of 10 operators in the 2nd study.

Recalculation based on the new dermal absorption values

During the experts' meeting, the refinement of the operator exposure using the new dermal absorption values of 3.9% for the concentrate and 20.9% for the dilution, was required to be performed by the RMS.

Using the new in use dilution dermal absorption value of 20.9%, estimated exposure to operators wearing PPE using field crop sprayer (FCS) is 58% to 308% of the AOEL (0.013 mg/kg bw/day), using air-assisted sprayer (AAS) is 238% to 3462% of AOEL, and using hand-held equipment (HH) is 146% to 1969% of AOEL (German and UK POEM models respectively).

Indoor (greenhouse) use

DAR:

Estimates of operator exposure were made according to the German model and the UK POEM for the indoor use using hand held equipment.

A field study was also submitted to assess operator exposure to IPM400 in greenhouse tomatoes. In the study 10 operators were monitored performing mixing/loading, application and equipment cleaning tasks. Applications were made with commercial sprayers, consisting of a spray tank connected to a handlance *via* a hose. The spray pumps were driven by either tractor, electric or portable mechanical engines. The tasks performed lasted 30 to 88 minutes and involved treating from 960 to just over 3700 m^2. Worker urine samples were collected over an 8-day period, at approximately 24 hour intervals. Inhalation exposure was determined with filters attached to the collars of worker clothing (fenitrothion determination). In urine 3-methyl-4-nitrophenol was determined, accounting for a bioconversion factor from fenitrothion to the metabolite of 80%. Creatinine excretion was established for the subjects involved in the study, to determine the completeness of urine collection. For two of the participants, results suggest that urine collection might have been somewhat incomplete. Collected data in greenhouse tomatoes-hand held application scenario showed exposure below the AOEL (25%).

The reliability of such study/results is rather questionable, because of the lack of representativeness with regard to the intended uses. Some weaknesses are present (e.g. the low number of workers, incomplete urine sampling) and some points are still to be clarified by the RMS (bioconversion factor scientific basis, extrapolation to a full working day).

Recalculation based on the new dermal absorption values

No recalculation was provided for the modelled greenhouse exposure as this was not considered necessary by the RMS given that a biomonitoring study was available.

In conclusion, the estimated operator exposure is below the AOEL only for field crop spraying on tomatoes (FCS), with the use of PPE. The assessment of exposure in greenhouses cannot be considered as conclusive, due to the questionable relevance of the information provided.

Worker exposure

DAR

The following assessments were provided in the DAR considering default dermal absorption values of 10-100%.

For **grape harvesting** (using the German re-entry model) exposure exceeds the AOEL even with the use of PPE (2000%). Therefore the applicant provided information on the relative release of fenitrothion from the CS formulation. These data were used to refine the assumption that no degradation of foliar residue occurs between applications: however, the total systemic exposure exceeded the AOEL even with the use of PPE.

For **tomato harvesting** (outdoor) the German re-entry model shows an exceedence of the AOEL even for the protected workers (1800% and 100%, no PPE and PPE, respectively).

For **tomato harvesting** (greenhouse) a 4 hour working day was considered more representative of real working practices by the RMS. With the German re-entry model, the systemic exposure exceeds the AOEL both for the unprotected (3400%) and the protected worker (200%). However, considering the DT_{50} values for residue decline and the long time interval between application and harvest (28 day PHI) it was accepted at the mammalian toxicology expert meeting (EPCO 18) that the exposure is likely to be below the AOEL to harvesters without PPE.

Recalculation based on the new dermal absorption values

For **general re-entry activities** in greenhouses the exposure assessment was recalculated with new dermal absorption values (an addendum was not provided, but a summary is presented in the ev. table - Aug 2005) showing again exposure estimates exceeding the AOEL (see table below).

The re-entry for outdoor scenarios was not revised.

In conclusion, the re-entry exposure shows levels above the AOEL for all the uses considered, except for harvesters of indoor tomatoes, whose exposure was considered below the AOEL without PPE by the experts, after considering likely residue decline in relation to the supported GAP. EFSA notes that a refinement with new dermal absorption values might lead to exposure levels below the AOEL for field crop spraying on tomatoes (FCS). However, the results need to be confirmed by calculations.

Bystander exposure

DAR

In the DAR, bystander exposure following application to glasshouse tomatoes was not considered further, since there is no potential for such an exposure.

Bystander exposure during hand held outdoor tomato use was considered by the RMS equivalent to the outdoor use via field crop sprayer and estimated exposure was 23% of the AOEL.

For bystander exposure during grape broadcast air-assisted sprayer, direct measurements conducted in UK for orchard application were used: considering the max in use concentration for table grapes, the estimated exposure exceeds the AOEL (1300%).

Recalculation based on the new dermal absorption values

No recalculation was provided by the RMS for outdoor uses based on the new dermal absorption values.

In conclusion, the bystander exposure shows levels below the AOEL for field crop spraying on tomatoes (FCS) and, based on a rough estimate still to be confirmed, also for hand-held spraying.

Overall conclusion

Outdoor use

Grapes: The estimated operator exposure exceeds the AOEL, as well as re-entry exposure estimates for workers not wearing PPE.

Tomatoes: the estimated operator exposure was below the AOEL only for field crop spraying using the German model for use via a tractor mounted sprayer with downward application on tomatoes, with the use of PPE. Re-entry exposure estimates for workers not wearing PPE exceed the AOEL.

Indoor (greenhouse) use

The biomonitoring study in greenhouse tomatoes showed exposure below the AOEL (maximum 25%). Working practises monitored in the study may be not representative of commercial practise and the study shows some uncertainties still to be clarified by the RMS. It was accepted at the expert meeting that, on the basis of the supported GAP, the exposure to harvesters without PPE would be below the AOEL. Re-entry exposure estimates for workers not wearing PPE exceed the AOEL.

A summary of the provided assessment is reported in the table below.

If a refinement for outdoor FCS is provided, it might be possible to individuate an intended use leading to exposure levels below the AOEL for operator, workers and bystanders, although calculations and results need to be confirmed.

Estimated exposure expressed as % of the AOEL; PPE is needed for all scenarios.

Use	Operator				Worker		Bystander	
	Dermal 10-100%		Dermal 3.9-20.9%		Dermal 10-100%	Dermal 3.9-20.9%	Dermal 10%	Dermal 3.9-20.9%
Outdoor	UK POEM	German	UK POEM	German				
Grapes (wine) air-assisted sprayer	16600%	1138 %	3461%	238%	2000%	N.a.*	1300%	N.a.
Tomatoes field crop sprayer	1562%	277%	307%	58%	100%	N.a.	23%	N.a.

Use	Operator				Worker		Bystander	
	Dermal 10-100%		Dermal 3.9-20.9%		Dermal 10-100%	Dermal 3.9-20.9%	Dermal 10%	Dermal 3.9-20.9%
Tomatoes/table grapes hand held	9431%	708 %	2000%	146%		N.a.	23% ?	N.a.
Indoor								
Tomatoes hand held	25%, field study of questionable quality				Based on DT_{50} for residue decline and the long PHI, the exposure is likely to be below the AOEL to harvesters without PPE.		Consi-dered not relevant	
						182%, General re-entry activities		

*N.a.: not assessed

3. Residues

Fenitrothion was discussed at the EPCO experts' meeting for residues (EPCO 19) in February 2005.

3.1. NATURE AND MAGNITUDE OF RESIDUES IN PLANT

3.1.1. PRIMARY CROPS

The metabolism of fenitrothion has been investigated in tomatoes and grapes under studies in accordance with the proposed representative uses. NMC was the major constituent of the residue found in both plants indicating that hydrolysis of fenitrothion is the major pathway of degradation leading to NMC, which is further conjugated mainly as glucoside, and DMPTA[4]. The fate of DMPTA was not further investigated as studies were carried out only with labelling of the phenyl ring of the molecule. Another metabolic pathway was identified in grapes only, consisting in the O-demethylation of fenitrothion leading to desmethylfenitrothion. Fenitrothion was identified in tomatoes but not in grapes. It has been demonstrated that NMC has no anticholinesterase activity, but information is lacking about the anticholinesterase potential of desmethyl-fenitrothion and of DMPTA. The residue definition proposed by the RMS and agreed by the expert meeting (EPCO 19) is fenitrothion for both monitoring and risk assessment, but it is the opinion of EFSA that it cannot be excluded that other compounds (desmethylfenitrothion and DMPTA) that may be present as residues could contribute to the toxicological burden. The toxicological properties of these compounds should be characterised. Depending on the result of these investigations and on the actual level of exposure

[4] DMPTA: dimethylphosphorothioic acid

of the consumer, the residue definition for risk assessment could be reconsidered for inclusion of these metabolites.

A sufficient number of supervised field residue trials were submitted to cover each of the representative uses supported by the applicant. Only fenitrothion was analysed. These trials support the establishment of MRLs of 0.1 and 3 mg/kg for tomatoes and grapes respectively. An issue was raised by the RMS on the reliability of these trials as they were conducted using a motorised knapsack sprayer, and the resulting homogeneity of the spray deposit with this type of equipment. The applicant submitted a sprayability study at the in-use concentration to address this issue, and the results of this study were considered acceptable by the expert meeting (EPCO 19). The reliability of the results of the field residue trials is further supported by storage stability studies demonstrating the stability of fenitrothion residues in tomatoes at -18°C for 13 months.

Studies on the effects of processing on the nature and levels of residues present in raw commodities were submitted by the applicant. Under conditions simulating pasteurisation, baking/brewing/boiling and sterilisation, fenitrothion degrades into desmethyl-fenitrothion, this degradation product being major and present at higher levels than fenitrothion in all conditions except pasteurisation. As mentioned above, the lack of knowledge on the anticholinesterase activity of this degradation product leads to the same restriction concerning the validity of the residue definition for processed commodities as for raw commodities. Studies on the production of processed commodities from tomatoes and grapes confirmed the degradation of fenitrothion with very low transfer factors to tomato juice, tomato puree, canned tomatoes, grape juice and wine. Desmethyl-fenitrothion was not analysed in these studies and the actual level of this compound in processed commodities is therefore not known.

3.1.2. SUCCEEDING AND ROTATIONAL CROPS

No data were submitted on metabolism and residues in succeeding and rotational crops. As indicated under point 4.1.2, the persistence of residues in soil can be above the trigger value (more than 10 % of active substance and relevant metabolites after 100 days) when fenitrothion is used as a capsule suspension formulation. Therefore a rotational crop metabolism study is required to support the indoor use on natural soil as well as the outdoor use in tomatoes. Depending on the results of this study further field rotational crops residue trials could be also required. These data requirements do not apply to vines (perennial crop) and to indoor grown tomatoes on artificial substrates.

3.2. NATURE AND MAGNITUDE OF RESIDUES IN LIVESTOCK

As representative uses of fenitrothion concern only grapes and tomatoes which are normally not fed to animals, no metabolism data is required and no residue definition needs to be established. Metabolism studies have however been submitted for lactating goats and laying hens. Identification of residues was carried out only in milk and eggs, indicating the presence of compounds based on the structure of fenitrothion and fenitrooxon. Due to their low amount and/or poor extractability, residues in animal commodities were not characterized. These studies are not sufficient to support a proposal for residue definition in animal commodities.

3.3. CONSUMER RISK ASSESSMENT

Detailed calculations concerning the exposure assessment dealt with under this point are to be found in the DAR and in the addendum on residues prepared by the EFSA. These calculations were made on the basis of the currently proposed residue definition for risk assessment, with fenitrothion as only compound taken under consideration.

The chronic dietary exposure assessment has been carried out according to the WHO guidelines for calculating Theoretical Maximum Daily Intakes (TMDI) and International (National) Estimated Daily intakes (I(N)EDI). Two consumption patterns were considered: the WHO European typical diet for adult consumers and the national diets of UK for infants, toddlers, child and adult populations, which take into consideration high individual consumption levels (at the 97.5th percentile of the distribution of consumptions in the respective populations).

For TMDI calculations, residues in grapes, tomatoes and their processed commodities were assumed to be at the level of the respective MRLs proposed on the basis of the supervised residue trials. No exposure resulting from the consumption of animal commodities was considered as no transfer of residues to livestock is expected on the basis of the representative uses. These calculations indicated an exceedence of the ADI.

Therefore I(N)EDI calculations were carried out in order to get a better estimate of the actual exposure to residues, using the STMR (Supervised Trials Median Residue level) in tomatoes, table and wine grapes as well as the calculated transfer factor for processed commodities. This resulted in calculations well below the ADI (the highest estimated exposure (30 % of the ADI) being calculated for toddlers in UK).

The acute exposure to residues of fenitrothion has been assessed according to the WHO model for estimates of short term intakes. Large portion consumption data for adults and toddlers in UK were used. Calculations were carried out considering residues in grapes and tomatoes at the respective MRLs as well as high unit to unit variability and showed potential exposures below the ARfD for tomatoes, but largely in excess of the ARfD (300 % and 1300% for adults and toddlers respectively) in the case of table grapes. The acute exposure resulting from high consumption of wine was not assessed.

It is important to note that these results concerning the chronic and the acute exposures cannot be considered as fully conclusive as only residues of fenitrothion were considered. As mentioned under point 3.1.1, degradation products, such as desmethylfenitrothion, are expected to be present in raw and processed commodities but were not analysed. This means that the actual toxicological burden for the consumer may be underestimated if these compounds are toxicologically relevant.

In conclusion a potential of acute risk for the consumers has been identified at least in case of consumption of treated table grapes. As far as the other commodities are concerned, areas of uncertainties, concerning the toxicological relevance of desmethylfenitrothion and DMPTA and, in case they are relevant, their actual levels in raw and processed commodities, need to be addressed before a robust risk assessment can be carried out.

3.4. PROPOSED MRLS

The following MRLs are supported by the results of supervised residue trials carried out according to the supported representative uses and their analysis according to statistical tool recommended by the current guidelines:

Table and wine grapes: 3 mg/kg

Tomatoes: 0.1 mg/kg

However, as far as table grapes are concerned, an acute risk for the consumers has been identified. Further information is also needed to assess the risk concerning wine grapes and tomatoes.

4. Environmental fate and behaviour

Fenitrothion was discussed at the EPCO Experts` meeting for environmental fate and behaviour (EPCO 16) in Jan./Feb. 2005.

4.1. FATE AND BEHAVIOUR IN SOIL

4.1.1. ROUTE OF DEGRADATION IN SOIL

Route and rate of degradation of fenitrothion under dark aerobic conditions at 20 °C or 25 °C was investigated in two separated studies with four soils (20 °C, 40 % MWHC) and one soil (25 °C, 75 % FMC) respectively. The five soils covered a range of pH (4.9 – 7.3), clay contents and organic matter content (0.9 – 4.5 %). In total three sandy loam soils and two clay loam soils were used in these experiments. Degradation was not tested at lower temperatures (10 °C).

Cleavage of the phosphoric ester bond is the main degradation step of fenitrothion in soil. This yields the major metabolite **NMC** (3-methyl-4-nitrophenol, max 44.5 % AR after 1d) and presumably the corresponding dimethyl-thiophosphoric acid. Substantial mineralization of fenitrothion was observed after 90 d (50.7 % AR – 69.3 % AR). Unextractable residue amounted for 23.3 % AR - 42.8 % AR after 90 d.

Degradation under dark anaerobic conditions at 25 °C was investigated in one study with one soil. Under these conditions **AM-FNT** (aminofenitrothion, O-(4-amino-3-methylphenyl) *O,O*-dimethyl phosphorothioate, max. 11.3 % at 3 d) **AA-FNT** (acetylaminofenitrothion, O-(4-acetylamino-3-methylphenyl) *O,O*-dimethyl phosphorothioate, max. 10.3 % AR between days 3 and 7) were found to be new major metabolites resulting from the reduction and acetylation of the nitro group of fenitrothion. The majority of the unextractable radioactivity was associated with the humin and fulvic acid fractions.

A soil photolysis study is available. Whereas photolysis slightly enhances degradation with respect to the dark controls, it is unlikely to contribute to the environmental degradation of fenitrothion. No major photolysis metabolites were found.

4.1.2. PERSISTENCE OF THE ACTIVE SUBSTANCE AND THEIR METABOLITES, DEGRADATION OR REACTION PRODUCTS

Degradation rate of fenitrothion was investigated in the same studies used to establish the route of degradation in soil. Fenitrothion is low persistent in soil under aerobic conditions ($DT_{50\ lab\ 20\ °C}$ = 2.6 - 2.8 d) when applied directly or formulated as and emulsifiable concentrate (EC). However, for the representative uses presented for the EU risk assessment, a capsule soluble (CS) formulation is proposed. A study to compare the degradation rate of the EC formulation with the encapsulated one shows that the half life is significantly longer for the encapsulated formulation ($DT_{50\ lab\ CS}$ = 82.3 d). Therefore, more laboratory and field dissipation studies with the CS formulation would be necessary to finalize the EU risk assessment (data gap identified by the RMS in the DAR). Two new laboratory studies and a new field dissipation study with the CS formulation have been presented to the RMS but have not been evaluated and peer reviewed. Whereas the RMS stated that this study would only be relevant for the outdoor uses, the exposure of natural soils from the use in protected crops was not completely excluded by the experts meeting. However, the meeting agreed that the data requirement would not be necessary when the product is used in greenhouses. Consequently, a restriction to use the product only in green houses should be proposed for fenitrothion until the data requirements are fulfilled.

The major metabolite NMC is low persistent in soil under aerobic conditions ($DT_{50\ lab\ 20\ °C}$ = 2.8 -3.3 d).

Anaerobic metabolites AM-FNT and AA-FNT degrade with half lives of approximately 16 and 50 d respectively under anaerobic conditions at 25 °C. Experts meeting confirmed that anaerobic conditions were not expected to be relevant for the representative uses.

PECs soil calculated in the DAR were based on the released rate from the capsules with a DT_{50} = 85.2 d, a half life for free fenitrothion of 1.98 d and a half life for metabolite NMC of 3.3 d). PEC soil were calculated for encapsulated and free fenitrothion for single (750 g/ha) and multiple (4 x 750 g/ha) applications. Accumulation in soil was also assessed. Plateau was reached after 2 yr for the encapsulated fenitrothion and after 3 yr for the free fenitrothion and its metabolite NMC. These values were used for the provisional risk assessment presented in the DAR. However, reassessment will be necessary once the data requirement for further soil degradation studies and field dissipation studies with the CS formulation is fulfilled. According the RMS, these values can not be regarded as worst case since a faster release rate will result in less persistence but at the same time higher peak concentrations will be reached for free fenitrothion. Also EFSA noted that the half life employed for free fenitrothion is not the worst case. Therefore, EU risk assessment for the soil compartment may not be considered concluded.

4.1.3. MOBILITY IN SOIL OF THE ACTIVE SUBSTANCE AND THEIR METABOLITES, DEGRADATION OR REACTION PRODUCTS

Batch adsorption/desorption studies are available for fenitrothion and its metabolite NMC. The results for these studies indicate that fenitrothion is medium mobile (K_{oc} = 252- 384 mL / g) and NMC (K_{foc} = 270-303 mL / g) is medium mobile.

No column leaching studies are available for fenitrothion and its metabolite NMC.

4.2. FATE AND BEHAVIOUR IN WATER

4.2.1. SURFACE WATER AND SEDIMENT

The hydrolytic stability of fenitrothion was studied in sterile aqueous buffer solutions (pH 5, 7, and 9) at 25 ºC. The DT_{50} values were calculated to be 191 – 200 d, 180 – 186 d, 100 – 101 d at pH 5, 7 and 9, showing a slow hydrolytic degradation and a tendency of more rapid degradation at basic pH conditions. Under natural conditions hydrolysis is assumed not to contribute significantly to the degradation of fenitrothion. **DM-FNT** (desmethylfenitrothion, *O*-methyl *O*-(3-methyl-4-nitrophenyl) phosphorothioate, max. 10.5 % of AR) was identified as a major hydrolysis metabolite under acidic conditions and NMC (max. 14.75 % AR) was found as major metabolite under basic conditions.
The release rate of the formulation IPM 400 CS was investigated in sterile aqueous buffer solutions at pH 5, 7 and 9. No pH dependent differences in the release rate were observed. Because of the slow release of fenitrothion no release rates were calculated but estimated to be beyond the study duration of 60 days. The results of a preliminary study report on the release rate of fenitrothion (from the CS formulation) suggest that fenitrothion is much faster released when the water was stirred (50 % release rate of 18 d) compared to static water conditions (50 % release rate of 250 d). The full study report was submitted before the experts meeting, but was not evaluated by the RMS on time for its discussion. The release rate of 250 days has been used in one of the PECgw simulations, based on a different study stated to be a preliminary work by the applicant. This study was required but it seems that only a summary exists since it was replaced by the final report. It is reasonable to expect that the further soil studies already required for the CS formulation will provide additional information on the release rate of fenitrothion in soil.

An aqueous photolysis study in buffer solution (acetic acid, pH 5) is available. The photolytic half life of fenitrothion was determined as 3.3 – 3.65 days (pH 5, 25 °C, irradiation equated to natural light in April, 40°N). **CA-FNT** (*O*-(3-carboxy-4-nitrophenyl) *O*,O-dimethyl phosphorothioate) was identified as a major photolysis metabolite with a maximum concentration of 10.2 % of AR measured after 14 days. Photolysis may contribute to the environmental degradation of fenitrothion in water. However, this contribution is deemed to be low for the fenitrothion applied as an encapsulated formulation.
Fenitrothion is not readily biodegradable in water.
A study to investigate the dissipation of fenitrothion (pure active substance) in two natural water-sediment systems is available. In this study fenitrothion dissipated rapidly from the water phase. Fenitrothion degraded in the water phase and shifted partly to the sediment phase where it reached a peak concentration after 1 to 3 days. The half lives for the water phase and the whole system were calculated to be $DT_{50water}$ = 0.88 – 1.27 d and $DT_{50whole\_system}$ =1.56-1.59 days. NMC, AM-FNT, **Unk 2** (tentatively identified as **DM-AM-FNT** (*O*-(4-amino-3-methylphenyl) *O*-hydrogen *O*-methyl phosphorothioate)), **Unk 6** (tentatively identified as **A-NMC** (*O*-acetyl-3-methyl-4-nitrophenol)) were identified as major metabolites in the water phase. A-NMC was proposed to be an artefact of the analytical procedure formed from NMC and therefore was excluded from further assessment of the surface water compartment. In the sediment phase only NMC was measured at levels > 10 % of AR. The metabolites reached the maximum concentrations within 2- 7 days after application of the test

substance. All metabolites declined to very low levels until the end of the study. Slow mineralization to CO_2 took place reaching a maximum of 14.4 % and 14.7 % of AR at the end of the study after 59 days. But most of the applied radioactivity accumulated in the NER fraction of the sediment reaching after 30 days almost the same levels which were measured at the end of the study (70.8 % and 80.9 % of AR). The constant and slow increase in CO_2 formation suggests slow further mineralization and release of CO_2 from the NER fraction.

An aerobic water-sediment study was conducted to compare the degradation of fenitrothion when applied as a CS formulation, as opposed to an EC formulation. The degradation of fenitrothion when applied as EC formulation was similar to the degradation of the pure active substance with a first order DT_{50} of 3-4 days for the whole system. When applied as CS formulation most of the fenitrothion was found in the sediment phase because the capsules tend to settle on the sediment surface. The DT_{50} for the CS formulated fenitrothion was beyond the duration of the study and estimated to be 84 – 97 days for the whole system.

In addition the degradation of CS formulated fenitrothion was investigated in a test with *Chironomus riparius*. A mean first order DT_{50} of 10.35 days was calculated for the total system. The reliability of the DT_{50} value is questionable since it was based on only three sampling dates.

The PEC_{SW} and PEC_{SED} were calculated for spray drift as the only entry route into surface water. A 50 % release rates of 7.8 and 88.1 d was used for the CS formulation to cover the high uncertainty on the available experimental data. A half life of 1.6 days (whole system) for the free fenitrothion was used for the PEC_{SW} / PEC_{SED} calculations. The total PEC fenitrothion was the sum of encapsulated and free fenitrothion. These $PEC_{SW/SED}$ may need to be revised in case of new information on the release rate is available. Values shown in the list of end points assume a buffer zone of 250 m. The PEC in sediment was based on a sediment layer of 1 cm of depth. PEC_{SW} values were provided also for the metabolites AM-FNT, DM-AM-FNT and NMC. It was noted by the RMS that the values have to be divided by 5 because the standard sediment layer to calculate the PEC in sediment has a depth of 5 cm.

The applicant submitted PEC_{SW} / PEC_{SED} calculation for the use in glasshouses based on the Netherlands scheme. However, this calculation was not evaluated by the RMS and proposed a no exposure situation for the use in an enclosed glasshouse. Experts' meeting concluded that potential surface water contamination arising from glasshouse representative use should in principle be assessed taking also into account the high potential risk to aquatic organisms and the potential for volatilization (see chapter 5.2.). However, the difficulties to perform this risk assessment at this stage, due to the lack of EU agreed procedure, were recognized by the meeting. It was expected that FOCUS air will provide guidance to address this issue.

4.2.2. POTENTIAL FOR GROUND WATER CONTAMINATION OF THE ACTIVE SUBSTANCE THEIR METABOLITES, DEGRADATION OR REACTION PRODUCTS

Ground water assessment for fenitrothion and major aerobic metabolite NMC was based on 80 % percentile average annual concentration at 1m depth resulting from FOCUS-PEARL v.1.1.1. simulations. Relevant scenarios were simulated for the outdoor representative uses (tomato and vines). Capsules were assumed not to be immobile in soil (Koc = 10 000). Two alternative modelling

exercises were performed assuming either instantaneous release or 250 d half life release from the capsules. It was concluded for both simulations and crops that concentrations of fenitrothion and the metabolite NMC were not expected to exceed 0.1 µg / L in ground water. Experts meeting agreed that outdoor uses represent a worst case with respect to the protected crop uses and therefore no separated assessment is necessary for these uses.

4.3. FATE AND BEHAVIOUR IN AIR

It is proposed to use fenitrothion as a microencapsulated formulation, which will reduce the potential for volatilization. According the Henry Law constant there is some potential for volatilization once released. However, half life in air was calculated to be 6 h indicating that long range transport is not likely.

5. Ecotoxicology

Fenitrothion was discussed at the EPCO Experts` meeting for ecotoxicology (EPCO 17) in Jan./Feb. 2005.

5.1. RISK TO TERRESTRIAL VERTEBRATES

The risk for birds and mammals from uptake of contaminated food items was calculated according to SANCO/4145/2000. The calculation of the acute, short-term and long-term risk to birds for the representative use in grapewine resulted in TER values far below the relevant Annex VI trigger values indicating a high risk to birds from the representative use in grapes. The risk to insectivorous birds for the representative use in leafy crops (tomatoes) was not calculated in the DAR. But the risk is expected to be similar to grapes since the application rates are the same and thus exposure is comparable. The applicant announced in September 2004 to conduct studies to refine the risk to birds. These studies were submitted but not evaluated because they were not considered relevant for the indoor use.

The first tier risk assessment for the representative outdoor uses (tomato and grapevine) resulted in TER values below the relevant Annex VI trigger values indicating a high acute and long term risk to mammals. Instead of a herbivorous mammal the risk to an insectivorous mammal was calculated for the use in tomatoes since the RMS considered this scenario as more realistic. The applicant disagreed to the choice of an insectivorous mammal and presented a refined risk assessment for a herbivorous mammal for the representative use in tomatoes. The assumptions used by the applicant for the refined risk assessment were not accepted because they were not supported by data. The risk assessment to birds and mammals was discussed in the EPCO Experts` meeting for ecotoxicology (EPCO 17) in Jan./Feb. 2005. The meeting confirmed the following data requirements for the outdoor uses in grapes and tomatoes: Risk refinement for the acute, short-term and long-term risk to birds and the long term risk to mammals from fenitrothion. Furthermore it was decided at the meeting that the acute toxicity of fenitrothion (technical) of 330 mg a.s./kg should be used for the TER calculations.

A high long term risk to birds and mammals was identified from the uptake of contaminated earthworms. Further risk refinement steps are required to address the long term risk to birds and mammals from uptake of contaminated earthworms. New information on the risk to birds and mammals from fenitrothion residues in earthworms were submitted by the applicant. This additional information was not evaluated by the RMS. Therefore an open point was set at the EPCO Experts` meeting for the RMS to evaluate the new information on the risk to earthworm eating birds and mammals in an addendum. This point is still open.

No risk assessment for secondary poisoning from uptake of contaminated fish and no risk assessment for the uptake of contaminated drinking water was presented in the DAR. The applicant submitted further information to address the risk of secondary poisoning from consumption of contaminated fish and a statement on the risk from uptake of contaminated drinking water. The RMS did not consider this new information. Therefore an open point was set at the expert meeting for the RMS to evaluate the risk to fish eating birds and mammals and the risk to birds and mammals from uptake of contaminated drinking water. This open point is still open.

The risk of the major plant metabolite NMC to birds and mammals was considered to be low. NMC appears in the metabolism of hens and rats and is rapidly excreted. Because of the short DT_{50} of NMC no chronic exposure is expected.

For the representative use in glasshouse no risk is anticipated for birds and mammals since exposure is negligible.

5.2. RISK TO AQUATIC ORGANISMS

Daphnia magna was the most sensitive tested aquatic species. The lowest observed endpoints for *Daphnia magna* were 48 h EC_{50} of 8.6 µg a.s./L and 21 d NOEC of 0.087 µg a.s./L. The risk assessment for the representative outdoor uses was based on worst case peak PECsw after the last application. The PECsw values were based on spray drift, 4 applications in tomato and 3 applications in grapevine, 77th percentile drift levels and a 59 % release rate of 88.1 days. The resulting acute TER values met the relevant Annex VI trigger of 100 only if buffer zones of 200 m (tomato) or 175 m (vine) were applied in the TER calculations. Therefore a high acute risk to aquatic organisms is indicated. The chronic TER values were calculated for a buffer distance of 250 m resulting in TERs of 1.3 and 2.2 for the representative outdoor uses in tomato and grapevine indicating a high chronic risk to crustaceans.

The exposure of aquatic organisms from the glasshouse use was discussed in the EPCO Experts` meeting for fate and behaviour (EPCO 16) in Jan./Feb. 2005. The applicant submitted a proposal of a risk assessment based on the Netherlands` scheme for calculating emissions from greenhouses. The RMS did not evaluate the applicant's risk assessment because it was considered by the RMS not to be needed at EU level. The RMS proposed a no exposure situation of surface water from the use in greenhouses. The meeting confirmed the need to calculate PECsw for the use in greenhouses but agreed that no EU-harmonised approach exists yet and some guidance is expected to become available with FOCUSair. Therefore the data requirement to address potential surface water contamination from greenhouses is still open. A final conclusion on the risk to aquatic organisms from the representative use in greenhouses cannot be drawn. However, taking into account the very

high toxicity to daphnids, a high risk to aquatic organisms from the greenhouse use cannot be excluded if exposure of aquatic organisms from greenhouse use is possible.
The risk of the major metabolites in the water-sediment systems, NMC and AM-FNT were tested with *Daphnia magna* (daphnids were about 100 times more sensitive than the next most sensitive taxonomic group of organisms). The acute TER values were calculated to be well above the relevant Annex VI trigger values for the representative outdoor uses in tomatoes and grapevine. Testing with the major water metabolite DM-AM-FNT was considered as not necessary because it is very unstable and the precursor AM-FNT is three orders of magnitude less toxic than fenitrothion. No chronic studies were conducted with the metabolites. Although the metabolites had relatively low DT_{50} values and were of low acute toxicity, the RMS raised concerns about chronic exposure to the metabolites because of the slow release nature of the formulation.
A mesocosm study was submitted by the applicant prior to the Experts´ meeting to address the risk to aquatic invertebrates. The mesocosm study was not evaluated by the RMS because it was considered as not relevant for the greenhouse use by the RMS. Therefore an open point was set for the RMS at the EPCO Experts´ meeting to evaluate the mesocosm study in an addendum. The open point is still open.

5.3. RISK TO BEES

The oral and contact toxicity to bees was tested with the technical fenitrothion and the formulation IPM 400 CS. The HQ values calculated for the oral and contact toxicity of technical fenitrothion were far above the Annex VI HQ trigger value of 50 suggesting a high risk to bees from technical fenitrothion. The HQ value for the oral toxicity of the formulation was calculated to be 45.5 and the HQ value for the contact toxicity was calculated to be 80, indicating a high risk to bees via this route of exposure. Higher tier studies with bees were available. However, the studies were conducted for other uses than the representative uses. It was not clear whether the available studies address the risk from the representative uses in tomatoes and vineyards because only one application was tested and the tested formulation was different from the lead formulation. The RMS assessed the risk to bees from the outdoor uses as high and proposed risk mitigation measures for bees at MS level (e.g. labelling "High risk to bees. Do not apply to corps in flower or to those in which bees are actively foraging. Do not apply when flowering weeds are present."). The risk assessment to bees was discussed at the EPCO expert meeting. It was agreed that risk mitigation measures for pollinating insects have to be set at MS level for the representative use in greenhouses. A new open point was set for the RMS to prepare an addendum to address the concerns regarding the comparability of the exposure in the higher tier studies to the representative use in tomatoes and vineyards, the comparability of the formulation and how long the capsules stay available to bees after application. This point is still open. Based on the available first tier risk assessment and the outcome of the discussion in the EPCO expert meeting it cannot be excluded that the representative outdoor uses (tomato and grapevine) pose a high risk to bees.

5.4. RISK TO OTHER ARTHROPOD SPECIES

No first tier laboratory studies were conducted by the applicant. Higher tier (extended laboratory dose response) tests were conducted with *Typhlodromus pyri*, *Aphidius rhopalosiphi*, *Orius laevigatus* and *Chrysoperla carnea*. In an extended laboratory test with *A. rhopalosiphi* > 50 % effects on mortality was observed at a dose rate of 750 g a.s./ha indicating a high risk to this species. No significant effects were seen on mortality or fecundity in tests with 42 d aged residues following an application of IPM 400 at a dose rate of 2 x 715 g a.s./ha and 2 x 750 g a.s./ha. The first two applications in the study were only 95 % of the proposed GAP. However, based on expert judgement it was concluded by the RMS that the study showed the potential for recolonisation. A limit test with IPM 400 was conducted with *T. pyri* where no effects of > 50 % on mortality were observed. The applied dose was 1500 g a.s./ha. But because of the multiple applications in the GAP, ESCORT 2 requires testing at a dose rate of 2025 g a.s./ha (750 g a.s./ha x MAF (2.7)). Therefore the risk to *T. pyri* was not fully addressed. 100 % and >90 % mortality were observed for *O. laevigatus* and *C. carnea* if exposed to freshly dried residues following an application of IPM 400 at a dose rate of 2 x 715 g a.s./ha and 2 x 750 g a.s./ha. No effect > 50 % on mortality or reproduction was observed in 7 d aged residues in both species. Although the first two applications in the test were only 95 % of the GAP. However, based on expert judgement it was considered that the potential for recolonisation was sufficiently demonstrated.

The non-target arthropod risk assessment was discussed at the EPCO experts` meeting. The meeting confirmed that the dose rate in the test with *T. pyri* was too low to address the risk from the representative outdoor uses (tomatoes and grapevine). However no data requirement was set because new information on the MAF refinement was submitted by the applicant in September 2004. This information was not evaluated by the RMS and therefore it is unclear whether this new information addresses the risk from the outdoor uses posed to *T. pyri*. For the greenhouse use the tested dose was sufficient. Because of the high toxicity to non-target arthropods the meeting proposed a labelling for the greenhouse use to protect species which are used for biological pest control. A new open point was set for the RMS to provide an elaborated risk assessment for the off-field risk from the representative outdoor uses (tomato and grapevine) to non-target arthropods. The open point is still open. A final conclusion on the risk to non-target arthropods can be drawn when the off-field risk assessment is made available.

5.5. RISK TO EARTHWOMS

The acute toxicity to earthworms (*Eisenia foetida*) was tested with fenitrothion (technical) and the soil metabolite NMC. Two chronic studies were conducted with the formulation IPM 400. The initial PEC soil of 1.04 mg a.s./kg soil was used for the calculation of acute TER values. The acute TERs of 111 and 875 for fenitrothion (technical) and NMC are well above the Annex VI trigger value of 10 indicating a low acute risk to earthworms. No acute effects were observed in the chronic studies with the formulation. The NOEC of 2.5 mg a.s./kg soil was used in the risk assessment resulting in a long term TER value of 1.2. This value is less than the relevant Annex VI trigger of 5 indicating a high long-term risk to earthworms. Further information was submitted by the applicant to address the long-term risk to earthworms. This information was not evalutated by the RMS. Therefore an open point

was set for the RMS at the EPCO Experts´ meeting to evaluate the information in an addendum. This open point is still open. Preliminary, the long term risk to earthworms from the representative outdoor uses has to be regarded as high.

The chronic risk from NMC posed to earthworms is considered to be low since earthworms are expected to be exposed to very low levels of the metabolite NMC and the acute risk is low. Based on the NOEC from the acute studies (12.5 mg NMC/kg soil) and the intial concentration of NMC in soil (0.02 mg NMC/kg soil) the TER is 625.

5.6. RISK TO OTHER SOIL NON-TARGET ORGANISMS

No information on the toxicity of fenitrothion to other soil non-target organisms was available. The DT_{50} of fenitrothion in soil is < 2 days indicating that fenitrothion is not persistant in soil. However fenitrothion is formulated as a slow release micro-capsule and the DT_{90}lab was estimated to be 283 days. A high long term risk was observed for earthworms and for non-target arthropods in the higher tier studies. Therefore a data requirement was set by the RMS to address the risk to other soil non-target macro-organisms. The applicant submitted further information to address the risk to soil non-target macro-organisms in September 2004. This information was not evaluated by the RMS because it was not considered as essential for the representative use in greenhouses. Therefore an open point was set for the RMS at the EPCO Experts´ meeting to evaluate the information in an addendum. This open point is still open. Preliminary the risk to soil non-target macro-organisms from the representative outdoor uses has to be regarded as high.

5.7. RISK TO SOIL NON-TARGET MICRO-ORGANISMS

Soil respiration and nitrification studies were conducted with fenitrothion (technical) and the formulation IPM 400. No statistical significant effects > 25 % were observed in the studies after 28 days of exposure to 2 or 10 mg a.s./kg soil. Due to the slow release formulation the studies should have been conducted longer than 100 days. However based on the absence of significant effects of >25 % at doses greater than the initial PEC soil (1.04 mg a.s./kg soil) the risk to soil micro-organisms was considered to be low. A data reqirement to address the risk of the major soil metabolite NMC was proposed at the evaluation meeting (14. 07. 04). The applicant provided further information prior to the EPCO experts´ meeting. The information was not evaluated by the RMS because it was not considered relevant by the RMS for glasshouse uses. The meeting set a new open point for the RMS to provide an addendum to evaluate the risk of the metabolite NMC to micro organisms. The open point is still open. Preliminary the risk to soil non-target micro-organisms from the representative outdoor uses has to be regarded as high.

5.8. RISK TO OTHER NON-TARGET-ORGANISMS (FLORA AND FAUNA)

The fungicidal activity of fenitrothion formulated as 40 % WP was tested with 7 different fungi species on cucumber, tomato, Japanese radish and wheat. Fenitrothion did not show any fungicidal activity. The herbicidal activity of fenitrothion formulated as 40 % WP was tested with *Xanthium stumarium* (Cocklebur), *Chenopodium album* (Lambsquarters), *Ambrosia trifida* (Common ragweed), *Sorghum halepense* (Johnsongrass) and *Setaria faberi* (Giant foxtail). Fenitrothion was applied at a

dose rate of 1000 g a.s./ha either 22 days post emergence or 29 days after seeding. No herbicidal activity was detected (based on visual signs of injury or death). Therefore the risk from fenitrothion to other non-target organisms is considered to be low.

5.9. Risk to biological methods of sewage treatment

The effect of fenitrothion (technical) on the respiration of activated sludge was tested in a 3 h-static test. No effect on respiration was observed up to the highest tested concentration of 1000 mg a.s./L. Therefore the risk of fenitrothion to biological methods of biological sewage treatment is considered to be low from the representative uses.

6. Residue definitions

Soil

Definitions for risk assessment: fenitrothion, NMC[5], AM-FNT[6] (anaerobic metabolite), AA-FNT[7] (anaerobic metabolite).

Definitions for monitoring: fenitrothion, NMC (a new study with NMC and soil non-target micro-organisms was submitted but not evaluated. This study could provide new information to assess the ecotoxicological relevance of NMC)

Water

Ground water

Definitions for risk assessment: fenitrothion, NMC

Definitions for monitoring: fenitrothion

Surface water

Definitions for risk assessment: fenitrothion, NMC, AM-FMT, DM-AM-FNT[8],

Definitions for monitoring: fenitrothion

Air

Definitions for risk assessment: fenitrothion

Definitions for monitoring: fenitrothion

[5] NMC: 3-methyl-4-nitrophenol
[6] AM-FNT: aminofenitrothion, O-(4-amino-3-methylphenyl) *O,O*-dimethyl phosphorothioate
[7] AA-FNT: acetylaminofenitrothion, O-(4-acetylamino-3-methylphenyl) *O,O*-dimethyl phosphorothioate
[8] DM-AM-FNT: UNK6, *O*-(4-amino-3-methylphenyl) *O*-hydrogen *O*-methyl phosphorothioate)

Food of plant origin

Definitions for risk assessment: fenitrothion (needs to be reconsidered should the toxicological burden of desmethyl fenitrothion and/or DMPTA[9] be significant)

Definitions for monitoring: fenitrothion

Food of animal origin

Definitions for risk assessment: no residue definition required

Definitions for monitoring: no residue definition required

[9] DMPTA: dimethylphosphorothioic acid

Overview of the risk assessment of compounds listed in residue definitions for the environmental compartments

Soil

Compound (name and/or code)	Persistence	Ecotoxicology
Fenitrothion	Very low to low persistent (DT_{50lab} (20°C) = 0.04 – 2.7 d) Medium persistent as in encapsulated formulation CS DT_{50lab} (20°C) = 85.2 d	A high chronic risk was identified for the CS formulation posed to earthworms.
NMC (3-methyl-4-nitrophenol)	Very low to low persistent (DT_{50lab} (20°C) = 1.75 – 3.3 d)	For earthworms the acute TER calculated to be 875. The acute risk posed by NMC is therefore considered to be low (triggers values not breached). A chronic earthworm TER of 625 was calculated. The chronic risk is considered to be low. A study with NMC and soil non-target micro-organisms was submitted but not evaluated. This study could provide new information to assess the ecotoxicological relevance of NMC.
Aminofenitrothion (AM-FNT) (anaerobic)	Moderate persistent (DT_{50lab} (25°C, anaerobic) = 16.3 d) Anaerobic conditions not considered relevant for the representative uses proposed for EU	No data with soil organisms available. .
Acetylaminofentitrothion (AA-FNT) (anaerobic)	Moderate persistent (DT_{50lab} (25°C, anaerobic) = 49.5 d) Anaerobic conditions not considered relevant for the representative uses proposed for EU	No data with soil organisms available. .

Ground water

Compound (name and/or code)	Mobility in soil	> 0.1 µg / L 1m depth for the representative uses (at least one FOCUS scenario or relevant lysimeter)	Pesticidal activity	Toxicological activity	Ecotoxicological activity
Fenitrothion	Medium mobile (K_{oc} = 252- 384 mL / g)	FOCUS modelling: No, triggers not exceeded for any of the uses and scenarios calculated.	Yes	Yes, assessed in the DAR	Yes
NMC (3-methyl-4-nitrophenol)	Medium mobile (K_{foc} = 270-303 mL / g)	FOCUS modelling: No, triggers not exceeded for any of the uses and scenarios calculated.	No data available No data required	Considered to be of significantly lower toxicity than parent (NOAEL 94.7 mg/kg bw/day in 6-month rat study).	Based on *Daphnia magna* data the most sensitive aquatic species, the acute risk is considered to be low. The new mesocosm study submitted using the CS formulation may provide further information.
Aminofenitrothion (AM-FNT) (anaerobic metabolite)	No data	Anaerobic conditions not considered relevant for the representative uses proposed for EU	No data available	No data available	Based on *Daphnia magna* data the most sensitive aquatic species, the acute risk is considered to be low. The new mesocosm study submitted using the CS formulation may provide further information.

Compound (name and/or code)	Mobility in soil	> 0.1 µg / L 1m depth for the representative uses (at least one FOCUS scenario or relevant lysimeter)	Pesticidal activity	Toxicological activity	Ecotoxicological activity
Acetylaminofenitrothion (AA-FNT) (anaerobic metabolite)	No data	Anaerobic conditions not considered relevant for the representative uses proposed for EU	No data available	No data available -	No data available The new mesocosm study submitted using the CS formulation may provide further information.

Surface water and sediment

Compound (name and/or code)	Ecotoxicology
Fenitrothion (water and sediment phase)	See point 5.2.
NMC (3-methyl-4-nitrophenol (water and sediment phase)	Based on *Daphnia magna*, the most sensitive aquatic species, the acute risk to aquatic organisms is considered to be low. The new mesocosm study with the CS formulation may provide further information on the chronic risk to aquatic life.
AM-FNT (water only)	Based on *Daphnia magna* data the most sensitive aquatic species, the acute risk to aquatic organisms is considered to be low. The new mesocosm study with the CS formulation may provide further information on the chronic risk.
DM-AM-FNT (water only)	No data available. DM-AM-FNT is not very stable. The precursor AM-FNT is about three orders of magnitude less toxic than fenitrothion. Therefore it is assumed that DM-AM-FNT poses a low acute risk to aquatic organisms. The new mesocosm study with the CS formulation may provide further information on the chronic risk of DM-AM-FNT.

Air

Compound (name and/or code)	**Toxicology**
Fenitrothion	Low acute inhalatory toxicity (LC_{50}>2.210 mg/L). No data available on repeated exposures

LIST OF STUDIES TO BE GENERATED,-STILL ONGOING OR AVAILABLE BUT NOT PEER REVIEWED

- A new shelf-life study is required to provide data on the levels of *S*-methyl fenitrothion in the stored formulation (using a "fresh" sample) (data gap identified at the expert meeting, date of submission unknown).
- Depending on the final residue definition for soil, an analytical method for monitoring purposes could be required (date of submission unknown)
- New supervised residue trials as well as processing studies to determine the levels of desmethyl fenitrothion and DMPTA in commodities. Depending on the result of these investigations, characterisation of the toxicological properties of these metabolites and reconsideration of the residue definition for risk assessment (data gap identified after experts' meeting, date of submission unknown; refer to point 3.3).
- A rotational crop metabolism study, and depending on the results of this study, field rotational crop residue trials (relevant for the representative uses in tomatoes in case of indoor use on natural soil or outdoor use; date of submission unknown; refer to point 3.1.2)
- A shelf-life study according to Directive 94/37/EC to provide data provide data on the levels of *S*-methyl fenitrothion in the stored formulation (data gap identified by experts' meeting, date of submission unknown; refer to chapter 1)
- Laboratory and field dissipation studies with the CS formulation are necessary to finalise the EU risk assessment (data requirement identified by RMS in the DAR, relevant for all representative uses). Two new laboratory studies and a new field dissipation study with the CS formulation have been presented by the applicant but have not been evaluated and peer reviewed (refer to point 4.1). It is reasonable to expect that these studies will provide enough information to support the worst case assumption of a release rate of 250 d used in the calculation of PEC_{GW}.
- Depending on the results of the field dissipation studies new PEC soil and soil risk assessment may be necessary (refer to point 4.1).
- To address potential surface water contamination by greenhouses uses. Applicant submitted PEC_{SW} / PEC_{SED} according NL scheme but have not been evaluated and peer reviewed (refer to point 4.2).
- Further risk refinement steps are necessary to address the risk from contaminated food items to birds and mammals from the representative outdoor uses (tomato and grapevine). Information submitted to the RMS in September 2004 (the data requirement was identified by the RMS in the DAR and confirmed by the EPCO expert meeting) (refer to point 5.1).
- Information on the risk of secondary poisoning from consumption of contaminated fish and on the long term risk to earthworm eating birds and mammals and a statement on the risk from uptake of contaminated drinking water was submitted to the RMS in September 2004 (the data requirement was identified by the RMS in the DAR). This information is relevant for the representative outdoor uses (tomato and grapevine) (refer to point 5.1).

- A mesocosm study (Memmert, 2004) was submitted to the RMS in September 2004. The study was not evaluated. The study is relevant for all representative uses (greenhouse and outdoor). (a data requirement to refine the risk to aquatic organisms was identified by the RMS in the DAR) (refer to point 5.2)
- An aquatic risk assessment for the greenhouse use based on the Netherlands assessment scheme was submitted by the applicant in September 2004. This risk assessment was not evaluated (refer to point 5.2).
- Further information to address the high long-term risk from fenitrothion posed to earthworms was submitted by the applicant in September 2004. (the data requirement was identified by the RMS in the DAR) This information is relevant for the representative outdoor uses and for greenhouses which are non-permanent constructions (e.g. foliar tunnels) or greenhouses with natural soil. The information was not evaluated by the RMS (refer to point 5.5).
- Information to address the toxicity to other soil non-target macro-organisms was submitted by the applicant in September 2004. (the data requirement was identified by the RMS in the DAR) This information is relevant for the representative outdoor uses and for greenhouses which are non-permanent constructions (e.g. foliar tunnels) or greenhouses with natural soil. The information was not evaluated by the RMS (refer to point 5.6).
- Information to address the risk from the soil metabolite NMC to soil non-target micro-organisms was submitted in September 2004. (the data requirement was proposed in the evaluation meeting in July 2004) This information is relevant for the representative outdoor uses and for greenhouses which are non-permanent constructions (e.g. foliar tunnels) or greenhouses with natural soil. The information was not evaluated by the RMS (refer to point 5.7).

CONCLUSIONS AND RECOMMENDATIONS

Overall conclusions

The conclusion was reached on the basis of the evaluation of the representative uses as insecticide as proposed by the applicant which comprises broadcast spraying in tomato and grapevine at application rates up to 750 g per hectare. Fenitrothion can be used only as insecticide.

The representative formulated product for the evaluation was "IPM 400", a capsule suspension concentrate (CS), registered under different trade names in southern Member States of the EU.

Adequate methods are available to monitor all compounds given in the respective residue definition. Residues in food of plant origin can be determined with a multi-method (The German S19 method has been validated). For the other matrices only single methods are available to determine residues of fenitrothion.

Sufficient analytical methods as well as methods and data relating to physical, chemical and technical properties are available to ensure that quality control measurements of the plant protection product are possible.

Fenitrothion (FNT) is of low acute oral and inhalatory toxicity, but it is harmful in contact with the skin**, (classification R21-is proposed)**. It is not a skin or an eye irritant in rabbits, but it is a skin sensitiser. Therefore, the **classification R43 – May cause sensitisation in contact with the skin, is proposed.** The relevant short and long term toxicity NOAELs are 1.32 mg/kg bw/day and 0.5 mg/kg bw/day respectively, based on impaired body weight and erythrocyte and brain cholinesterase inhibition. FNT does not have genotoxic or carcinogenic potential. It is not a reproductive and developmental toxicant. No evidence of delayed neurotoxicity was found in hens following acute and subacute exposures. The proposed ADI for fenitrothion is 0.005 mg/kg bw/day, SF of 100. The proposed AOEL and the ARfD are 0.013 mg/kg bw/day. The estimated operator exposure in grapes exceeds the AOEL, as well as re-entry exposure estimates for workers not wearing PPE. In outdoor tomatoes: the estimated operator exposure was below the AOEL only for field crop spraying (FCS) with the use of PPE. Re-entry exposure estimates for workers not wearing PPE exceed the AOEL. A biomonitoring study in greenhouse tomatoes not fully representative of the intended uses showed exposure below the AOEL (maximum 25%). The exposure to harvesters without PPE would be acceptable. Exposure estimates for general re-entry activities for workers not wearing PPE exceed the AOEL.

Metabolism studies of fenitrothion in tomatoes and grapes indicate that the major metabolic pathway proceeds through the hydrolysis of the compound leading to 3-methyl-4-nitrophenol and dimethylphosphorothioic acid. 3-methyl-4-nitrophenol is further conjugated and has no anticholinesterase activity. Due to the labelling position, the fate of dimethylphosphorothioic acid was not further investigated. Another minor pathway consists in O-demethylation of fenitrothion leading to desmethylfenitrothion. The proposed residue definition for monitoring and risk assessment is fenitrothion only. However the possible contribution of desmethylfenitrothion and dimethylphosphorothioic acid to the toxicological burden is not known and should be investigated before the residue definition for risk assessment can be finalised.

Sufficient supervised residue trials were submitted in accordance with the representative uses and supporting the establishment of MRLs at 3 and 0.1 mg/kg in grapes (table and wine grapes) and tomatoes respectively. The behaviour of residues through processing was investigated and it was shown that fenitrothion is degraded into desmethylfenitrothion under hydrolysis conditions. Low transfer factors of fenitrothion were calculated for the processing to grape juice, wine, tomato puree and tomato juice.

Metabolism studies in livestock were submitted although not required as the representative uses do not imply animal exposure to residues of fenitrothion through feedingstuffs. These studies were not sufficient to build a complete picture of the nature of the residues to be expected in all animal commodities.

Acute and chronic risk assessments have been carried out taking into account fenitrothion residues only. These assessments have demonstrated a potential for acute risk for the consumer resulting from the consumption of treated table grapes. For the other commodities, although the exposure to fenitrothion residues is below the trigger toxicological values, a robust conclusion is not possible at

this stage, given the lack of information on the toxicological relevance and the actual levels in commodities of desmethylfenitrothion and dimethylphosphorothioic acid.

In soil under dark aerobic conditions, cleavage of the fenitrothion phosphoric ester yields the major metabolite NMC. Substantial mineralization was observed after 90 d (50.7- 69.3 % AR) and unextractable residue amounted for 23.3-42.8 % AR after 90 d. Under dark anaerobic conditions AM-FNT and AA-FNT were found to be the major metabolites.

Photolysis in soil is unlikely to contribute to the environmental degradation of fenitrothion.

Fenitrothion is low persistent in soil under aerobic conditions ($DT_{50\ lab\ 20\ °C}$ = 2.0 - 2.8 d) when applied directly or formulated as and emulsifiable concentrate (EC). However, a capsule soluble formulation (CS) is proposed for the representative uses. Half life is significantly longer for the encapsulated formulation ($DT_{50\ lab\ CS}$ = 82.3 d) and more laboratory and field dissipation studies are needed to finalize the EU risk assessment. New laboratory and field dissipation studies with the CS formulation have been presented but have not been evaluated by the RMS. The experts' meeting agreed to propose a restriction to use only in green houses until the data requirements for the CS formulation are fulfilled.

The major metabolite NMC is low persistent in soil under aerobic conditions ($DT_{50\ lab\ 20\ °C}$ = 2.8 -3.3 d).

PECs in soil were calculated for encapsulated and free fenitrothion for the field uses. These values were used for the provisional risk assessment presented in the DAR. According the RMS, these values can not be regarded as worst case. In addition, EFSA noted that the half life employed for free fenitrothion is not the worst case. Therefore, risk assessment for the EU representative uses may not be considered concluded and reassessment will be necessary once the data requirement for further soil studies with the CS formulation is fulfilled.

Fenitrothion is medium mobile (K_{oc} = 252- 384 mL / g) and NMC is medium mobile (K_{foc} = 270-303 mL / g) in soil.

Fenitrothion shows a slow hydrolytic degradation that is not expected to contribute significantly to its environmental degradation.

The release rate of the CS formulation was investigated in sterile aqueous buffer solutions. The full study report was submitted before the experts' meeting, but was not evaluated by the RMS on time for its discussion. The release rate of 250 days has been used in one of the PEC_{GW} simulations, based on a different study stated to be a preliminary work by the applicant. This study was required but it seems that only a summary exists since it was replaced by the final report. It is reasonable to expect that the further soil studies already required for the CS formulation will provide additional information on the release rate of fenitrothion in soil.

Photolysis may contribute to the environmental degradation of fenitrothion in water. However, this contribution is deemed to be low for the fenitrothion applied as an encapsulated formulation.

Fenitrothion is not readily biodegradable in water.

In water-sediment systems fenitrothion (pure active substance) dissipated rapidly from the water phase. NMC, AM-FNT, **Unk 2** (tentatively identified as **DM-AM-FNT**), **Unk 6** (tentatively identified as **A-NMC,** and considered an analytical artefact of NMC) were the major metabolites in

the water phase. In the sediment phase only NMC was measured at levels above 10 % of AR. All metabolites declined to very low levels until the end of the study. Most of the applied radioactivity accumulated in the NER fraction of the sediment that undergoes slow further mineralization with CO_2 release.

An aerobic water-sediment study compares the degradation of fenitrothion applied as the CS formulation with an EC formulation. When applied as CS formulation the capsules tend to settle in the sediment phase. The DT_{50} for the CS formulated fenitrothion was beyond the duration of the study and estimated to be 84 – 97 days for the whole system. In addition the degradation of CS formulated fenitrothion was investigated in a test with *Chironomus riparius*. The reliability of the DT_{50} derived from this study is questionable since it was based on only three sampling dates.

The PEC_{SW} and PEC_{SED} were calculated for the field uses with spray drift as the only entry route into surface water. The total concentration of fenitrothion was calculated as the sum of encapsulated and free fenitrothion. These $PEC_{SW/SED}$ may need to be revised on basis of new information on the release rate. PEC_{SW} values were also provided for the metabolites AM-FNT, DM-AM-FNT and NMC.

The applicant submitted PEC_{SW} / PEC_{SED} calculation for the use in glasshouses based on the Netherlands scheme. However, this calculation was not evaluated by the RMS which proposed a non exposure situation for this use. Experts' meeting concluded that potential surface water contamination arising from glasshouse representative use needs to be assessed taking also into account the high potential risk to aquatic organisms and the potential for volatilization (see chapter 5.2.). However, the difficulties to perform this risk assessment at this stage, due to the lack of EU agreed procedure, were recognized by the meeting.

On basis of the FOCUS ground water calculations, concentrations of fenitrothion and the metabolite NMC were not expected to exceed 0.1 µg / L in ground water, irrespective to the release rate from the capsules ($DT_{50\ release}$ = 0 – 250 d were simulated).

According the Henry Law constant there is some potential for volatilization of fenitrothion. The use as a microencapsulated formulation will reduce this potential for volatilization. Furthermore, half life in air was calculated to be 6 h indicating that long range transport is not likely.

Further risk refinement steps are necessary to address the risk to birds and mammals from the representative outdoor uses. New information was made available by the applicant on the risk of secondary poisoning from consumption of contaminated fish and on the long term risk to earthworm eating birds and mammals and a statement on the risk from uptake of contaminated drinking water. This new information was not evaluated by the RMS. The information should be evaluated to assess the risk from outdoor uses. A high acute and chronic risk was identified for aquatic organisms from the representative outdoor uses. Even with buffer zones as large as 250 m the chronic TER values are still below the Annex VI trigger value of 10. Taking into account the very high toxicity to daphnids, a high risk to aquatic organisms from the greenhouse use cannot be excluded if exposure of aquatic organisms from greenhouse use is possible. A risk assessment for the greenhouse use should be conducted at MS level taking also into account the mesocosm study which was submitted by the applicant but not evaluated by the RMS. A high risk to bees was shown for contact toxicity to bees for the formulation IPM 400 CS. Risk mitigation measures for pollinating insects are suggested to be

set at MS level. An open point was set at the EPCO Experts` meeting for the RMS to clarify in collaboration with the applicant the open questions regarding the submitted higher tier studies in an addendum. This was not done yet and therefore it is not clear whether the submitted higher tier studies sufficiently address the risk to bees. A high risk to non-target arthropods was indicated because freshly dried residues of the formulation led to significant mortality in the higher tier tests. However, it was concluded that the potential for recolonisation was shown for the most sensistive species *Aphidius rhopalosiphi*. An open point was set for the RMS to provide an elaborated risk assessment for the off-field risk from the representative outdoor uses. A final conclusion on the risk to non-target arthropods from the outdoor uses can be drawn after conducting an elaborated off-field risk assessment. A labelling for the greenhouse use is proposed to protect species which are used for biological pest control. The information submitted by the applicant to address the long-term risk to earthworms should be evaluated to assess the risk to earthworms from the representative outdoor uses. Further information was submitted by the applicant to address the risk to other soil non-target macro-organisms and to address the risk of the soil metabolite NMC to soil non-target micro-organisms. This information was not evaluated by the RMS but should be taken into account to assess the risk to soil non-target macro- and micro-organisms.
The risk of fenitrothion to other non-target organisms (flora) and biological methods of biological sewage treatment is considered to be low.

Particular conditions proposed to be taken into account to manage the risk(s) identified

- Restriction to use only in glass houses until the data requirement for soil degradation studies and the corresponding risk assessment is fulfilled (refer to 4.1).
- Risk assessment of the soil compartment has not been concluded for the representative uses proposed. Nevertheless this assessment will not be necessary for situations were the product is used in glass houses (refer to 5.5 and 5.6).
- Risk mitigation measures are needed to minimise contamination of surface water (refer to 5.2).
- Risk mitigation measures for pollinating insects (e.g. labelling, refer to point 5.3)
- Because of the high toxicity to non-target arthropods, labelling is proposed to protect species which are used for biological pest control. (refer to 5.4)

Critical areas of concern

- Fenitrothion shows explosive properties with respect to thermal sensitivity.
- The estimated operator exposure exceeds the AOEL in all outdoor scenarios except for field crop spraying with the use of PPE. Exposure in greenhouse has been assessed with a field study whose reliability is rather limited (only supported a specific type of application on indoor tomatoes).
- Re-entry exposure estimates exceed the AOEL for all re-entry activities except harvesting in greenhouses.

- Bystander exposure estimates exceed the AOEL for air assisted spraying in grapes and represent the 23% of the AOEL for field crop spraying.
- A potential acute risk for consumers has been identified resulting from the consumption of treated table grapes, taking into account the exposure to fenitrothion only. The dietary risk resulting from the application of fenitrothion on wine grapes and tomatoes cannot be assessed in a robust way due to the uncertainty concerning the actual exposure of the consumers to desmethylfenitrothion and DMPTA and the toxicological relevance of these compounds.
- The risk to birds and mammals from the representative outdoor uses.
- The acute and chronic risk to aquatic organisms. Even buffer zones of up to 250 m are not sufficient for the representative outdoor uses to achieve chronic TER values above the relevant Annex VI trigger value of 10.
- A high risk to aquatic organisms from the representative use in greenhouses cannot be excluded if contamination of surface water is possible. This has to be evaluated at MS level.
- The risk to bees.
- The risk to non-target arthropods.
- The long-term risk from fenitrothion posed to earthworms.
- The risk to other soil non-target macro-organisms.
- The risk of the soil metabolite NMC to soil non-target micro-organisms.

APPENDIX 1 – LIST OF ENDPOINTS FOR THE ACTIVE SUBSTANCE AND THE REPRESENTATIVE FORMULATION

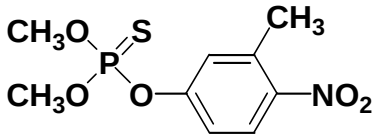
(Abbreviations used in this list are explained in appendix 2)

Appendix 1.1: Identity, Physical and Chemical Properties, Details of Uses, Further Information

Active substance (ISO Common Name) ‡	Fenitrothion
Function (e.g. fungicide)	Insecticide

Rapporteur Member State	United Kingdom
Co-rapporteur Member State	--

Identity (Annex IIA, point 1)

Chemical name (IUPAC) ‡	*O*,*O*-dimethyl *O*-4-nitro-*m*-tolyl phosphorothioate
Chemical name (CA) ‡	*O*,*O*-dimethyl *O*-(3-methyl-4-nitrophenyl) phoshorothioate
CIPAC No ‡	35
CAS No ‡	122-14-5
EEC No (EINECS or ELINCS) ‡	204-524-2
FAO Specification ‡ (including year of publication)	35/TC/S 1988 minimum purity 910 g/kg (declared 930 g/kg ± 20 g/kg) *S*-methyl fenitrothion* max 20 g/kg water max 1 g/kg
Minimum purity of the active substance as manufactured ‡ (g/kg)	930 g/kg,
Identity of relevant impurities (of toxicological, environmental and/or other significance) in the active substance as manufactured (g/kg)	*S*-methyl fenitrothion max 5 g/kg
Molecular formula ‡	$C_9H_{12}NO_5PS$
Molecular mass ‡	277.24
Structural formula ‡	

***** In the FAO specification *S*-ethyl fenitrothion is mentioned. That this is a typing error was confirmed by Gero Vaagt (Senior Officer, Pesticide Management Group, Plant Production and Protection Division, Food and Agriculture Organization of the United Nations).

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Physical-chemical properties (Annex IIA, point 2)

Melting point (state purity) ‡	0 ± 1 °C (99.2%) Measured up to 360 °C
Boiling point (state purity) ‡	Not determined due to decomposition of fenitrothion prior to boiling (99.1%).Measured up to 360 °C
Temperature of decomposition	Decomposition occurred at about 210 °C. An exothermic peak in the DTA curve and a black residue in the cell were observed (99.1%). Required if bp or mp cannot be determined due to decomposition or sublimation
Appearance (state purity) ‡	Clear light yellow liquid (100%) Deep yellow red oily liquid (94..3%)liquids or solids
Relative density (state purity) ‡	1.328 (99.2%)
Surface tension	68.5 mN/m
Vapour pressure (in Pa, state temperature) ‡	6.76×10^{-4} Pa at 20 °C 1.57×10^{-3} Pa at 25 °C (by interpolation)
Henry's law constant (Pa m^3 mol^{-1}) ‡	9.86×10^{-3} Pa m^3 mol^{-1}
Solubility in water ‡ (g/l or mg/l, state temperature)	19 mg/l at 20 °C effect of pH not determined
Solubility in organic solvents ‡ (in g/l or mg/l, state temperature)	*n*-hexane: 2.5 % w/v at 20°C *iso*-propnol: 14.6 % w/v at 20°C xylene: >50 % w/v at 20°C methanol: >50 % w/v at 20°C acetone: >50 % w/v at 20°C ethyl cellosolve: >50 % w/v at 20°C cyclohexanone >50 % w/v at 20°C ethyl acetate: >50 % w/v at 20°C chloroform: >50 % w/v at 20°C acetonitrile: >50 % w/v at 20°C
Partition co-efficient (log POW) ‡ (state pH and temperature)	log Pow 3.319 ± 0.080 at 25 °C effect of pH not determined
Hydrolytic stability (DT50) ‡ (state pH and temperature)	pH 5: 191-200 days at 25 °C pH 7: 180-186 days at 25 °C pH 9: 100-101 days at 25 °C
Dissociation constant ‡	N/A as dissociation will not occur

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

UV/VIS absorption (max.) ‡ (if absorption > 290 nm state ε at wavelength)	pH 0.9: 268.0 nm pH 6.7: 266.8 nm pH 13.0: 263.8 nm Neutral: ε = 4.21 x 10^3 l $mol^{-1}cm^{-1}$ at 290 nm Acidic: ε = 4.39 x 10^3 l $mol^{-1}cm^{-1}$ at 290 nm Alkaline: ε = 2.37 x 10^3 l $mol^{-1}cm^{-1}$ at 290 nm In the pH 13 solution, fenitrothion is decomposed under the alkaline condition.
Photostability (DT50) ‡ (aqueous, sunlight, state pH)	3.3-3.6 days at 25 °C and pH 5
Quantum yield of direct phototransformation in water at Σ > 290 nm ‡	7.98 x 10^{-4} at 313 nm
Flammability ‡	Autoflammability: 299 ± 5 °C
Explosive properties ‡	Explosive when subjected to thermal stimuli

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Summary of representative uses evaluated (fenitrothion)*

Crop and/or situation	Member State or Country	Product name	F G or I	Pests or Group of pests controlled	Formulation		Application				Application rate per treatment			PHI (days)	Remarks:
(a)			(b)	(c)	Type (d-f)	Conc. of as (i)	method kind (f-h)	growth stage & season (j)	number min max (k)	interval between applications (min)	kg as/hL min max	water L/ha min max	kg as/ha min max	(l)	(m)
Tomato	EU	Fenitrocap, IPM400	G	Aphids	CS	400 g/l	Foliar spray	BBCH 39-51	1	n.a.	0.15-0.375	200-500	0.75	n.a.	Application at beginning of infestation before flowering. [1]
Tomato	S-EU	Fenitrocap	F	Helicoverpa	CS	400 g/l	Foliar spray	BBCH 81	1-4	14	0.067-0.150	500-600	0.40-0.75	28	Application at larvae hatching. [4]
Grapevine (Wine)	EU	Fenitrocap, IPM 400	F	Metcalfa Lobesia	CS	400 g/l	Foliar spray	BBCH 81	1-3	14	0.15	200-500	0.3-0.75	28	Grape moths: application at larvae hatching. Scales and other insects: application at the beginning of migration of larvae or at the beginning of infestation. [2] [4]
Grapevine (Table)	S-EU	Fenitrocap, IPM400	F	Metcalfa Lobesia	CS	400 g/l	Foliar spray	BBCH 81	1-3	14	0.03-0.0375	1000-2000	0.3-0.75	35#	Same as above. # PHI will be determined after 2001 residue trials. Spain: if bagged bunches, last spray minimum 10 days before bagging. Italy : if covered tendone, last spray minimum 10 days before covering [2] [3] [4]

[1] The risk assessment has revealed a risk in section 2 (Re-entry exposure)
[2] The risk assessment has revealed a risk in section 2 (Operator and worker exposure)
[3] The risk assessment has revealed a risk in section 3 (Acute dietary risk for the consumer)
[4] The risk assessment has revealed a risk in section 5

* Uses for which the risk assessment cannot be concluded are marked grey.
(a) For crops, the EU and Codex classifications (both) should be used; where relevant, the use situation should be described (*e.g.* fumigation of a structure)
(b) Outdoor or field use (F), glasshouse application (G) or indoor application (I)
(c) *e.g.* biting and suckling insects, soil born insects, foliar fungi, weeds
(d) *e.g.* wettable powder (WP), emulsifiable concentrate (EC), granule (GR)
(e) GCPF Codes - GIFAP Technical Monograph No 2, 1989
(f) All abbreviations used must be explained
(g) Method, *e.g.* high volume spraying, low volume spraying, spreading, dusting, drench
(h) Kind, *e.g.* overall, broadcast, aerial spraying, row, individual plant, between the plant - type of equipment used must be indicated
(i) g/kg or g/l
(j) Growth stage at last treatment (BBCH Monograph, Growth Stages of Plants, 1997, Blackwell, ISBN 3-8263-3152-4), including where relevant, information on season at time of application
(k) Indicate the minimum and maximum number of application possible under practical conditions of use
(l) PHI - minimum pre-harvest interval
(m) Remarks may include: Extent of use/economic importance/restrictions

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1.2: Methods of Analysis

Analytical methods for the active substance (Annex IIA, point 4.1)

Technical as (principle of method)	Samples are analysed by GC-FID
Impurities in technical as (principle of method)	Samples are HPLC-UV
Plant protection product (principle of method)	Free fenitrothion is determined by GC-FID. Total fenitrothion is determined by dissolution in tetrahydrofuran and analysis by GC-FID.

Analytical methods for residues (Annex IIA, point 4.2)

Food/feed of plant origin (principle of method and LOQ for methods for monitoring purposes)	Samples are extracted with acetone:water (2:1 v/v), cleaned up by liquid-liquid partition with ethyl acetate/cyclohexane (1:1 v/v) followed by GPC, and analysed by GC-MSD Matrix: grape, tomato. LOQ: Grape: 0.05 mg/kg, tomato: 0.10 mg/kg
Food/feed of animal origin (principle of method and LOQ for methods for monitoring purposes)	*Not required, since no residue definition is proposed.*
Soil (principle of method and LOQ)	Samples are extracted with acetone:water (2:1 v/v), cleaned up by liquid-liquid partition with ethyl acetate/cyclohexane (1:1 v/v) followed by GPC, and analysed by GC-MSD LOQ: 0.01 mg/kg
Water (principle of method and LOQ)	Samples are extracted by liquid-liquid partition with dichloromethane and analysed by GC-NPD. Residues are confirmed using a different stationary phase. LOQ: 0.1µg/l (drinking- and surface water)
Air (principle of method and LOQ)	Air filters are extracted with hexane and analysed by GC-NPD. Residues are confirmed using a different stationary phase. LOQ: 0.04 µg/m^3
Body fluids and tissues (principle of method and LOQ)	*Not required (not classified as toxic or very toxic)*

Classification and proposed labelling (Annex IIA, point 10)

with regard to physical/chemical data	E Explosive R2: Risk of explosion by shock, friction, fire or other sources of ignition.

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1.3: Impact on Human and Animal Health

Absorption, distribution, excretion and metabolism in mammals (Annex IIA, point 5.1)

Rate and extent of absorption ‡	Rapid and almost complete absorption (86 – 100 % in urine after 7 days after a low or high dose).
Distribution ‡	Well distributed into organs and tissues. Liver>>whole blood>residual carcass after low dose
Potential for accumulation ‡	Limited potential
Rate and extent of excretion ‡	Rapid; 88-99.8 % in urine within 24h after a low dose
Metabolism in animals ‡	Extensively metabolised. No parent recovered in urine of rats, mice, rabbits and dogs. Primarily conjugates of parent, fenitrothion and conjugates and 3-methyl-4-nitrophenol and conjugates
Toxicologically significant compounds ‡ (animals, plants and environment)	Parent and metabolites.

Acute toxicity (Annex IIA, point 5.2)

Rat LD_{50} oral ‡	330 mg/kg bw (male) or 800 mg/kg bw (female) in first study (10% Tween 80 solvent) and 1700 (male) or 1720 (female) in second study (undiluted). **R22**
Rat LD_{50} dermal ‡	890 mg/kg bw (males) and 1200 mg/kg bw (female). **R21**
Rat LC_{50} inhalation ‡	2.2 mg/L. The maximum attainable concentration.
Skin irritation ‡	Not irritant
Eye irritation ‡	Not irritant
Skin sensitization ‡ (test method used and result)	Sensitizing in M&K maximisation study. **R43**

Short term toxicity (Annex IIA, point 5.3)

Target / critical effect ‡	Inhibition of cholinesterase activity
Lowest relevant oral NOAEL / NOEL ‡	1.32 mg/kg bw/day in 13-week dietary study in rats with neuropathological assessments.
Lowest relevant dermal NOAEL / NOEL ‡	3 mg/kg bw/day in 21-day dermal study in rabbits
Lowest relevant inhalation NOAEL / NOEL ‡	Not determined. Not relevant

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Genotoxicity ‡ (Annex IIA, point 5.4)

.....	Overall, not considered a genotoxic compound

Long term toxicity and carcinogenicity (Annex IIA, point 5.5)

Target/critical effect ‡	Inhibition of cholinesterase activity in brain and erythrocytes
Lowest relevant NOAEL / NOEL ‡	0.5 mg/kg bw/day
Carcinogenicity ‡	Not carcinogenic in rats and mice

Reproductive toxicity (Annex IIA, point 5.6)

Reproduction target / critical effect ‡	Reduced pup body weights, viability and lactation at maternally toxic dose levels.
Lowest relevant reproductive NOAEL / NOEL ‡	Parental: 0.7 mg/kg bw/day Offspring and reproductive: 3.1 mg/kg bw/day
Developmental target / critical effect ‡	Increased incidence of abortions in rabbits considered primarily a consequence of maternal toxicity in the absence of any supporting evidence of developmental toxicity.
Lowest relevant developmental NOAEL / NOEL ‡	Parental: 10 mg/kg bw/day Foetotoxicity: 30 mg/kg bw/day

Neurotoxicity / Delayed neurotoxicity ‡ (Annex IIA, point 5.7)

.....	No evidence of delayed neurotoxicity in hens after acute or subacute exposure. Acute neurotoxicity study in rats: tremors, reduced body temperature and motor activity at ≥ 50 mg/kg bw in both sexes but no findings in males at 12.5 mg/kg bw and no neuropathological changes in both sexes. Sub-chronic neurotoxicity study in rats with neuropathological assessments: NOAEL was 1.32 mg/kg bw/day based on impaired body weight gain and reduction in erythrocyte and brain cholinesterase

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Other toxicological studies ‡ (Annex IIA, point 5.8)

.....	3-methyl-4-nitrophenol was of significantly lower toxicity than parent (NOAEL 94.7 mg/kg bw/day); fenitrooxon was of comparable toxicity to parent (NOAEL 0.91 mg/kg bw/day in 6-month dietary toxicity studies and oral LD_{50} 24 mg/kg bw in rats)

Medical data ‡ (Annex IIA, point 5.9)

.....	Medical examination of factory workers have not shown any treatment-related effects. Very limited information was provided for clinical cases and poisoning incidents and no information was provided for general population and epidemiological studies.

Summary (Annex IIA, point 5.10)	Value	Study	Safety factor
ADI	0.005 mg/kg bw/day	2-year dietary study in rats	100
AOEL	0.013 mg/kg bw/day	13-week dietary study with neurological investigations	100
ARfD (acute reference dose)	0.013 mg/kg bw/day	13-week dietary study with neurological investigations	100

Dermal absorption (Annex IIIA, point 7.3)

.....	*In vitro* dermal absorption study with human skin - (including taped strips): 3.9% for the concentrate and 20.9% for the dilution for the micro capsulated formulation only.

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Acceptable exposure scenarios (including method of calculation)

Operator	For the product IPM400 there are different scenarios presented for the intended uses supported Outdoor Grapes, air assisted sprayer: The estimated exposure is above the AOEL according to the UK-POEM and German model: German model: Without PPE 1923%, with PPE 238% UK POEM: Without PPE 5538%, with PPE 3461% Tomatoes, field crop sprayer: The estimated exposure is above the AOEL except according to the German model with PPE considered German model: Without PPE 1538%, with PPE 58% UK POEM: Without PPE 2923%, with PPE 307% Tomatoes, hand held (also considered by the RMS as a surrogate for the indoor use): The estimated exposure is above the AOEL German model: Without PPE 423%, with PPE 146% UK POEM: Without PPE 11 770%, with PPE 2000% Indoor The estimated exposure is based on a field study (biomonitoring) is 25% of the AOEL However, the study shows some uncertainties due for instance to the low number of workers, incomplete urine sampling, as well as choice of conversion factor for the biomarker used. Moreover, it is not clear if the study is representative of commercial practices.

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Workers	Outdoor Grape harvesting (default dermal absorption 10-100%) with PPE German re-entry model 2000% Tomato harvesting (default dermal absorption 10-100%) Without PPE with PPE German re-entry model 1800% 100% Indoor Harvesting in greenhouses, (default dermal absorption 10-100%), Without PPE with PPE German re-entry model 3400% 200% **Refinement** with new dermal absorption values: Outdoor: Not performed Indoor: Estimated exposure still above the AOEL (182%).
Bystanders	Outdoor: Grape broadcast air-assisted sprayer (worst case) estimated exposure is above the AOEL (1300%, default dermal absorption 10-100%). Indoor: Hand held tomato use: it is considered equivalent by the RMS to the outdoor use via field crop sprayer, 23% of the AOEL (default dermal absorption 10-100%).

Classification and proposed labelling (Annex IIA, point 10)

with regard to toxicological data	Xn Harmful R22 Harmful if swallowed R21 Harmful in contact with skin. R43 May cause sensitization in contact with skin

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1.4: Residues

Metabolism in plants (Annex IIA, point 6.1 and 6.7, Annex IIIA, point 8.1 and 8.6)

Plant groups covered	Fruit (Tomato and grape)
Rotational crops	Study required
Plant residue definition for monitoring	Fenitrothion
Plant residue definition for risk assessment	Fenitrothion Note: the toxicological relevance of desmethylfenitrothion and dimethylphosphorothioic acid is unknown. Therefore this definition could be reconsidered in the future.
Conversion factor (monitoring to risk assessment)	None

Metabolism in livestock (Annex IIA, point 6.2 and 6.7, Annex IIIA, point 8.1 and 8.6)

Animals covered	Goat and hen (but deficiencies in studies)
Animal residue definition for monitoring	No residue definition proposed as no significant exposure of livestock
Animal residue definition for risk assessment	No residue definition proposed as no significant exposure of livestock
Conversion factor (monitoring to risk assessment)	-
Metabolism in rat and ruminant similar (yes/no)	-
Fat soluble residue: (yes/no)	-

Residues in succeeding crops (Annex IIA, point 6.6, Annex IIIA, point 8.5)

.....	Study required

Stability of residues (Annex IIA, point 6 introduction, Annex IIIA, point 8 introduction)

.....	Residues of fenitrothion were stable for up to 13 months in frozen tomatoes

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Residues from livestock feeding studies (Annex IIA, point 6.4, Annex IIIA, point 8.3)

Intakes by livestock ≥ 0.1 mg/kg diet/day:	Ruminant: no	Poultry: no	Pig: no
Muscle Liver Kidney Fat Milk Eggs	No feeding studies required		

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Summary of critical residues data (Annex IIA, point 6.3, Annex IIIA, point 8.2)

Crop	Northern or Mediterranean Region	Trials results relevant to the critical GAP (a)	Recommendation/comments	MRL	STMR (b)
Tomatoes	S	6x0.01, 0.02 and 0.04	Out door use in Southern Europe is more critical than protected use.	0.1	0.01
Tomatoes (protected)	N&S	7x0.01, 0.02		0.1	0.01
Grapes (table)	S	0.05, 0.07, 0.09, 0.12, 0.17, 0.17, 0.20, 0.21, 0.22, 0.27, 0.32, 0.33, 0.36, 0.40, 0.41, 1.8, 2.1		3	0.22
Grapes (wine)	N	0.19, 0.21, 0.38, 0.56, 1.1, 1.2, 1.3, 2.1	Results suggest that use in the Northern region is critical	3	0.83
	S	0.28, 0.31, 0.45, 0.62, 0.75			0.45

(a) Numbers of trials in which particular residue levels were reported *e.g.* 3 x <0.01, 1 x 0.01, 6 x 0.02, 1 x 0.04, 1 x 0.08, 2 x 0.1, 2 x 0.15, 1 x 0.17
(b) Supervised Trials Median Residue *i.e.* the median residue level estimated on the basis of supervised trials relating to the critical GAP

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Consumer risk assessment (Annex IIA, point 6.9, Annex IIIA, point 8.8)

ADI	0.005 mg/kg bw/day
TMDI (% ADI) according to WHO European diet	114 %
IEDI (% ADI) according to WHO European diet	1%
NEDI (% ADI) according to British diets	Less than 30% for all populations of consumers
Factors included in NEDI	STMRs Wine – processing factor of 0.005 Tomato paste and juice – processing factor of 0.3
ARfD	0.013 mg/kg bw/day
NESTI (% ARfD) according to British large portion consumption data	Grapes : 1250 % toddlers, 300 % adults Tomatoes : 40 % toddlers, 7 % adults

Note: all the intake calculation (chronic and acute) only consider fenitrothion, they must therefore be regarded as provisional as long as the actual amount in commodities and the toxicological relevance of desmethylfenitrothion and dimethylphosphorothioic acid is unknown.

Processing factors (Annex IIA, point 6.5, Annex IIIA, point 8.4)

Crop/processed crop	Number of studies	Transfer factor	% Transference *
Tomato Juice Puree Canned	2	 0.3 0.3 0.1	
Grapes Juice Must Wine	2	 0.04 0.2 <0.005	

* Calculated on the basis of distribution in the different portions, parts or products as determined through balance studies

Proposed MRLs (Annex IIA, point 6.7, Annex IIIA, point 8.6)

Tomato	0.1 mg/kg
Grapes (table)	3 mg/kg
Grapes (wine)	3 mg/kg

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1.5: Fate and Behaviour in the Environment

Route of degradation (aerobic) in soil (Annex IIA, point 7.1.1.1.1)

Mineralization after 100 days ‡	At 25°C, [^{14}C-phenyl]-label: 53.3-54.4% after 92-122 d, (1 soil, sandy loam), At 20°C, [^{14}C-phenyl]-label: 50.7-69.3% after 90 d, (2 soils, sandy loam), 53.9-58.9% after 90 d, (2 soils, clay loam).
Non-extractable residues after 100 days ‡	At 25°C, [^{14}C-phenyl]-label: 23.2-25.6% after 92-122 d, (1 soil, sandy loam), At 20°C, [^{14}C-phenyl]-label: 23.3-42.8% after 90 d, (2 soils, sandy loam), 35-38.1% after 90 d, (2 soils, clay loam).
Relevant metabolites - name and/or code, % of applied ‡ (range and maximum)	Major metabolites in laboratory soil studies. Aerobic laboratory conditions: [^{14}C-phenyl]-label 3-methyl-4-nitrophenol (NMC): maximum of 16.8-44.5% AR after 1-3 d, (5 soils)

Route of degradation in soil - Supplemental studies (Annex IIA, point 7.1.1.1.2)

Anaerobic degradation ‡	Mineralisation: 0.1% AR after 92-122 d (1 soil, sandy loam) Non-extractable residues: 55.5-79.4% AR after 92-122 d (after fractionation to fulvic acid, humic acid and humin, 20.9% AR remained unextracted at 92 d), (1 soil, sandy loam) Metabolites: [^{14}C-phenyl]-label, (1 soil, sandy loam + water extract) 3-methyl-4-nitrophenol (NMC): max. 14% AR after 2 d Aminofenitrothion (AM-FNT): max. 11.2% AR after 3 d Acetylaminofenitrothion (AA-FNT): max. 10.3% AR after 3-7 d)
Soil photolysis ‡	Mineralisation: max 4.3% AR after 30 d Non-extractable residues: max. 6.8% AR after 30 d Metabolites: No major metabolites

Rate of degradation in soil (Annex IIA, point 7.1.1.2, Annex IIIA, point 9.1.1)

Method of calculation	Laboratory studies: **(a)** first order kinetics **(b)** 2-phase exponential model, graphically estimated DT50s **(c)** first order (non-linear curve fitting program, MicroCal Origin v.3.5) **(d)** Calculation using Q_{10} factor of 2.2.

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Laboratory studies ‡ (range or median, with n value, with r^2 value)	[^{14}C-phenyl]-fenitrothion DT_{50lab}: ‡ **(a)** (25°C, aerobic) 1.98 d (based on data points 0-7 d, 1 soil sandy loam, $r^2 = 0.98$) **(b)** (20°C, aerobic) 0.04-1.4 d (4 soils, sandy loam & clay loam, $r^2 = 0.99$). (Refitted to first order DT_{50lab} of 2.6-2.8 d, $r^2 = 0.72$-0.88. Mean of 2.7 days used in PEC_{gw} calculations). NMC DT_{50lab}: ‡ **(a)** (25°C, aerobic) 3.3 d, (based on 5 data points from 3-14 d, 1 soil sandy loam, $r^2 = 0.93$) **(b)** (20°C, aerobic) 1.75-2.8 d (4 soils, sandy loam & clay loam, $r^2 = 0.99$-1.0). (Refitted to first order DT_{50lab} of 2.8-3.3 d, $r^2 = 0.9$-0.95. Mean of 3.1 days used in PEC_{gw} calculations). Encapsulated (CS) formulation DT_{50lab}: **(c)** (20°C, aerobic) 85.2 d (1 soil sandy loam, $r^2 \geq 0.97$) Data requirements for further laboratory and field dissipation studies with the CS formulation still open. Studies submitted by the applicant but not evaluated.
	[^{14}C-phenyl]-fenitrothion DT_{90lab}: ‡ **(a)** (25°C, aerobic) 6.58 d (based on data points 0-7 d, 1 soil sandy loam, $r^2 = 0.98$) **(b)** (20°C, aerobic) 2.16-4.7 d (4 soils, sandy loam & clay loam, $r^2 = 0.99$). (Refitted to first order DT_{90lab} of 9 d, $r^2 = 0.72$-0.88). NMC DT_{90lab}: ‡ **(a)** (25°C, aerobic) 10.8 d, (1 soil sandy loam, $r^2 = 0.93$) **(b)** (20°C, aerobic) 5.5-7.1 d (4 soils, sandy loam & clay loam, $r^2 = 0.99$-1.0). (Refitted to first order DT_{90lab} of 9-11 d, $r^2 = 0.9$-0.95). Encapsulated (CS) formulation $DT_{90la\ b}$: **(c)** (20°C, aerobic) 283 d (1 soil sandy loam, $r^2 \geq 0.97$) Data requirements for further laboratory and field dissipation studies with the CS formulation still open. Studies submitted by the applicant but not evaluated.

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

	[^{14}C-phenyl]-fenitrothion DT_{50lab} (10°C, aerobic): ‡ **(a & d)** 6.5 d (based on data points 0-7 d, 1 soil sandy loam, $r^2 = 0.98$) **(b & d)** 0.09-3 d (4 soils, sandy loam & clay loam, $r^2 = 0.99$). NMC DT_{50lab} (10°C, aerobic): ‡ **(a & d)** 10.9 d, (1 soil sandy loam, $r^2 = 0.93$) **(b & d)** 3.9-6.2 d (4 soils, sandy loam & clay loam, $r^2 = 0.99$-1.0).
	[^{14}C-phenyl]-fenitrothion DT_{50lab} (25°C, anaerobic): ‡ **(a)** 0.8 d (based on mean data points 0-7 d, 1 soil sandy loam + water extract, $r^2 = 0.94$) NMC DT_{50lab} (25°C, anaerobic): **(a)** 1.2 d (but based on only 3 data points between 2-7 d, 1 soil, sandy loam + water extract, $r^2 = 0.99$). AM-FNT DT_{50lab} (25°C, anaerobic): **(a)** 16.3 d (but based on only 4 data points between 3-30 d, 1 soil, sandy loam + water extract, $r^2 = 0.87$). AA-FNT DT_{50lab} (25°C, anaerobic): **(a)** 49.5 d (1 soil, sandy loam + water extract, $r^2 = 0.87$).
	[^{14}C-phenyl]-fenitrothion DT_{50lab} (25°C, photolysis): **(a)** 85 d (1 soil, sandy loam, $r^2 = 0.77$) irradiated compared to 182 d ($r^2 = 0.39$) in dark.
	Degradation in the saturated zone: ‡ No data
Field studies ‡ (state location, range or median with n value)	DT_{50f}: ‡ No data. Field studies not triggered by degradation data on technical fenitrothion or metabolites, but release rate of a.s. from CS formulation results in a DT_{50lab} >60 days. Protocol provided for field dissipation study using CS formulation in North & South Europe, report planned for completion mid 2004. Data requirements for further laboratory and field dissipation studies with the CS formulation still open. Studies submitted by the applicant but not evaluated.

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

	DT_{90f}: ‡ No data. As above.
Soil accumulation and plateau concentration ‡	No data. As above.

Soil adsorption/desorption (Annex IIA, point 7.1.2)

K_f /K_{oc} ‡ K_d ‡ pH dependence ‡ (yes / no) (if yes type of dependence)	Koc: **Fenitrothion** [^{14}C-phenyl]-label: 252 - 384 ml/g (mean Koc 322 ml/g, 1/n = 0.86-1.04, 3 soils) **NMC** [^{14}C]-label: 270 - 303 ml/g (mean Koc 285 ml/g, 1/n = 0.71-0.81, 3 soils) Kf: **Fenitrothion** 4.9 - 18 ml/g (mean 12 ml/g, 3 soils) **NMC** 2.42 - 7.84 ml/g (mean 5.95 ml/g, 3 soils) Possible indication of a trend of increased sorption at lower soil pH, but based on a very small sample size, (only 3 agricultural soils + 1 non-agricultural soil).

Mobility in soil (Annex IIA, point 7.1.3, Annex IIIA, point 9.1.2)

Column leaching ‡	Not required.
Aged residues leaching ‡	Not required.
Lysimeter/ field leaching studie ‡	Not required.

PEC (soil) (Annex IIIA, point 9.1.3)

Note: These PEC in soil were considered to represent necessarily a worst case by the RMS and were used only for the provisional risk assessment provided in the DAR. New PEC soil may need to be calculated once the laboratory and field studies with the CS formulation are evaluated.

Method of calculation	Assumed: Degradation pathway as: Encapsulated a.s. → Free a.s. → NMC First order DT_{50} of 85.2 days for Encapsulated a.s. First order DT_{50} of 1.98 days for Free a.s. First order DT_{50} of 3.3 days for NMC. 50% release rate of free a.s. from capsule of 82.3 days.

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

	Encapsulated a.s. is not available for degradation & 100% free a.s. converts to NMC. PECs for total fenitrothion calculated from sum of encapsulated & free fenitrothion. PECs for free fenitrothion also calculated from the peak concentration onwards.
Application rate	Single application of 750 g a.s./ha to outdoor tomatoes, at BBCH growth stage 81 with 70% crop interception (i.e. 30% reaches soil = 225 g as/ha). 70% crop interception used instead of 80% to also cover use on vines BBCH 81). 90th percentile spray drift values used. Multiple applications of 4 x 750 g a.s./ha to outdoor tomatoes, with 14 day spray intervals between, over a 4 year period. Other assumptions as above. 77th percentile spray drift values used. ECs calculated from immediately after last application. (Key: F = Free, T = Total)

PEC$_{(s)}$		Single application (mg/kg soil) Actual	Single application (mg/kg soil) Time weighted average	Multiple application (mg/kg soil) Actual	Multiple application (mg/kg soil) Time weighted average
Initial		0.3 (T)	-	1.037 (T)	-
Short term	24h	0.0021 (F), 0.299 (T)	0.0012 (F), 0.299 (T)	0.0019 (F), 1.031 (T)	- (F), 1.034 (T)
	2d	0.0035 (F), 0.299 (T)	0.0019 (F), 0.299 (T)	0.0203 (F), 1.024 (T)	- (F), 1.030 (T)
	4d	0.0051 (F), 0.296 (T)	0.0032 (F), 0.298 (T)	0.0217 (F), 1.009 (T)	- (F), 1.023 (T)
Long term	7d	0.0061 (F), 0.290 (T)	0.0043 (F), 0.296 (T)	0.0223 (F), 0.986 (T)	- (F), 1.012 (T)
	28d	0.0057 (F), 0.245 (T)	0.0061 (F), 0.274 (T)	0.0193 (F), 0.831 (T)	0.021 (F), 0.933 (T)
	50d	0.0048 (F), 0.205 (T)	0.0056 (F), 0.252 (T)	0.0154 (F), 0.695 (T)	0.0193 (F), 0.857 (T)
	100d	0.0032 (F), 0.136 (T)	0.0046 (F), 0.210 (T)	0.0108 (F), 0.463 (T)	0.0161 (F), 0.714 (T)

Following single application: free fenitrothion peaked about 11 days after treatment.
Following multiple applications: free fenitrothion peaked about 7 days after the last (4th) application.

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

$PEC_{(s)}$ DAYS AFTER PEAK CONC.	Single Application (mg/kg soil) Actual	Single Application (mg/kg soil) Time weighted average	Multiple Application (mg/kg soil) Actual	Multiple Application (mg/kg soil) Time weighted average
Peak conc. of free fenitrothion.	0.0064 (F)	-	0.0223 (F)	-
Short term 24h	0.0064 (F)	0.0064 (F)	0.0223 (F)	0.0223 (F)
2d	0.0063 (F)	0.0064 (F)	0.0222 (F)	0.0223 (F)
4d	0.0063 (F)	0.0063 (F)	0.0220 (F)	0.0222 (F)
Long term 7d	0.0062 (F)	0.0063 (F)	0.0216 (F)	0.0220 (F)
28d	0.0052 (F)	0.0058 (F)	0.0183 (F)	0.0204 (F)
50d	0.0043 (F)	0.0054 (F)	0.0153 (F)	0.0188 (F)
100d	0.0029 (F)	0.0045 (F)	0.0102 (F)	0.0157 (F)

Soil Metabolite: NMC

$PEC_{(s)}$ (for multiple application, taken as days after 4th application)	Single Application (mg/kg soil) Actual	Single Application (mg/kg soil) Time weighted average	Multiple Application (mg/kg soil) Actual	Multiple Application (mg/kg soil) Time weighted average
Initial /(Peak)	0.0000, (0.0056)	-	0.0155, (0.0199)	-
Short term 24h	0.0002, (0.0056)	0.0001, (0.0056)	0.0158, (0.0199)	0.0086, (0.0199)
2d	0.0007, (0.0056)	0.0002, (0.0056)	0.0162, (0.0198)	0.0088, (0.0199)
4d	0.0018, (0.0055)	0.007, (0.0056)	0.0173, (0.0197)	0.0091, (0.0198)
Long term 7d	0.0035, (0.0054)	0.0016, (0.0055)	0.0188, (0.0194)	0.0097, (0.0197)
28d	0.0054, (0.0046)	0.0055, (0.0052)	0.0184, (0.0165)	0.0126, (0.0184)
50d	0.0045, (0.0039)	0.0051, (0.0047)	0.0155, (0.0138)	0.0136, (0.0169)
100d	0.0030, (0.0026)	0.0043, (0.0040)	0.0103, (0.0092)	0.0133, (0.0141)

Values in parentheses = $PEC_{(s)}$ in terms of days after the peak concentration of NMC reached.
Following single application: NMC peaked about 20 days after treatment.
Following multiple applications: NMC peaked about 10-17 days after the last (4th) application.

Route and rate of degradation in water (Annex IIA, point 7.2.1)

Hydrolysis of active substance and relevant metabolites (DT_{50}) ‡ (state pH and temperature)	pH 5, 25°C: DT_{50} 191-200 d (first order, r^2 = 0.93-0.99) Metabolite, DM-FNT: 10.05% AR (30 days) pH 7, 25°C: DT_{50} 180-186 d (first order, r^2 = 0.96-0.99) Metabolite, DM-FNT: 6.75% AR (30 days)

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

	pH 9, 25°C: DT_{50} 100-101 d (first order, r^2 = 0.97-0.98) Metabolite, NMC: 14.75% AR (30 days) Release rate of a.s. from capsules in sterile water pH 5, 7 and 9, 20°C: 50% release rate = > 60 d, (beyond study duration). Preliminary data: 50% release rate = 250 d (static water), 18 d (water constantly stirred).
Photolytic degradation of active substance and relevant metabolites ‡	Xenon arc lamp >290 nm, continuous irradiation (equated to natural light April 40°N & 135°E. Intensity equated to half that of CIE global standard sun.) pH 5, 25°C: DT_{50} = 3.3 - 3.65 d Metabolite CA-FNT: 10.2% AR (14 days)
Readily biodegradable (yes/no)	No
Degradation in water/sediment	Laboratory water-sediment study **[^{14}C-phenyl]-fenitrothion**. First order calculated using non-linear regression analysis (r^2 = >0.99).
- DT_{50} water ‡	System A: 0.88 d System B: 1.27 d
- DT_{90} water ‡	System A: 2.94 d System B: 4.2 d
- DT_{50} whole system ‡	System A: 1.59 d System B: 1.56 d
- DT_{90} whole system ‡	System A: 5.3 d System B: 5.19 d
- DT_{50} whole system ‡	Laboratory water-sediment study **CS vs. EC formulation**. First order calculated using a curve fitting program. CS: 84.3 - 96.6 d (mean 90.4 d, r^2 <0.26) EC: 3.1 - 3.6 d (mean 3.35d, r^2 >0.97) DT_{90} whole system not calculated.
- DT_{50} whole system ‡	Laboratory water-sediment study with *Chironomus riparius* **CS formulation**. First order, but calculated on basis of only 3 sample points (0, 7 and 25 days after treatment). CS: 10.21-10.48 d (mean 10.35 d, r^2 = 0.92-0.99)
Mineralization	Laboratory water-sediment study [^{14}C-phenyl]-fenitrothion. System A: 14.4% AR (at 59 d study end, n=1) System B: 14.7% AR (at 59 d study end, n= 1)

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Non-extractable residues	Laboratory water-sediment study [^{14}C-phenyl]-fenitrothion. System A: max. 70.8% AR (at 59 d study end, =1) System B: max. 75.8% AR (at 59 d study end, =1)
Distribution in water / sediment systems (active substance) ‡	Laboratory water-sediment study **[^{14}C-phenyl]-fenitrothion**. Fenitrothion accounted for: System A: max. 28.5% AR in sediment after 1 d, (n.d. at 59 d study end). System B: max. 9.5% AR in sediment after 3 d, (n.d. at 59 d study end). System A & B: n.d. in water at 59 d study end. Laboratory water-sediment study **CS vs. EC formulation**. Total fenitrothion accounted for: **CS**: max. 88.5- 96.3% in sediment after 2- 4 d, (48.6-80.3% at 30 d, study end) **EC**: max. 16.8- 18.1% in sediment after 1- 2 d (0-0.4% at 30 d, study end). CS & EC: ≤1% in water at 30 d, study end.
Distribution in water / sediment systems (metabolites) ‡	Laboratory water-sediment study [^{14}C-phenyl]-fenitrothion. **NMC (+A-NMC)**: accounted for max. 15.1- 23.6% in water after 2 d. AM-FNT: accounted for max. 18% in water after 3 d. DM-AM-FNT: accounted for max. 16.9% in water after 7 d NMC: accounted for max. 12.8% in sediment after 3 d

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

PEC (surface water) (Annex IIIA, point 9.2.3)

Method of calculation	Notifier calculated PECsw for encapsulated, free and total fenitrothion and the metabolites, NMC, AM-FNT and DM-AM-FNT for up to 1-50 m buffer zone distances. A 50% release rate (RT50) of 7.8 and 88.1 days was used for free fenitrothion from the capsules. RMS also calculated PECsw for total fenitrothion from 75-250 m buffer zones distances. **Values shown below are using RT50 of 88.1 days, assumptions of a static** 1 ha pond 0.3 m deep with 5 cm deep sediment layer and spray drift values appropriate for a 250 m buffer zone.
Application rate	750 g a.s/ha (x 4 applications for outdoor tomatoes and x 3 applications for vines).
Main routes of entry	Spray drift. (Assumed 77th percentile spray drift for multiple application, 90th percentile spray drift for single application).

Outdoor Tomatoes

PEC$_{(sw)}$		Single application (µg/l) Actual	Single application (µg/l) Time weighted average	Multiple application (µg/l) Actual	Multiple application (µg/l) Time weighted average
Initial		0.030	0.030	0.068	0.068
Short term	24h	0.030	0.030	0.068	0.068
	2d	0.030	0.030	0.067	0.068
	4d	0.029	0.030	0.066	0.067
Long term	7d	0.028	0.029	0.065	0.066
	14d	0.027	0.028	0.061	0.065
	21d	0.025	0.028	0.058	0.063
	28d	0.024	0.027	0.055	0.061
	42d	0.022	0.026	0.049	0.058

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Vines

$PEC_{(sw)}$	Single application (µg/l) Actual	Single application (µg/l) Time weighted average	Multiple application (µg/l) Actual	Multiple application (µg/l) Time weighted average
Initial	0.020	0.020	0.040	0.040
Short term 24h	0.020	0.020	0.040	0.040
2d	0.020	0.020	0.040	0.040
4d	0.019	0.020	0.039	0.040
Long term 7d	0.019	0.019	0.038	0.039
14d	0.018	0.019	0.036	0.038
21d	0.017	0.018	0.034	0.037
28d	0.016	0.018	0.032	0.036
42d	0.014	0.017	0.029	0.034

Glasshouse Use on Tomatoes

Method of calculation	Exposure considered negligible when application made to crop grown in enclosed glasshouse or similar structure. Data requirement to address potential surface water contamination due to glass house uses was identified during the peer review. Calculations according NL scheme provided by the notifier but not evaluated.
Application rate	One application of 750 g a.s./ha per crop

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

PEC (sediment)

Method of calculation	A PECsw value was used in the ecotoxicological risk assessment for sediment-dwelling organisms, based on a spiked water study using Chironomid larvae. Therefore, the PECsediment values, presented below for completeness, have not been relied upon in the ecotoxicology risk assessment. The Notifier calculated PECsed for encapsulated, free and total fenitrothion and the metabolite, NMC, assuming both single and multiple applications for outdoor tomatoes and vines, for up to 1-50 m buffer zone distances. A 50% release rate (RT50) of 7.8 and 88.1 days was used for free fenitrothion from the capsules and DT50 of 1.6 days for free fenitrothion. A 30 cm deep water body with 1 cm deep sediment layer was assumed, with the justification that the Koc in sediment was >500. (This has not been corrected to 5 cm sediment depth, as the PECsediment values were not relied on. However, **if they are needed for the risk assessment they should be divided by 5 to reflect 5 cm sediment depth**). A worst case assumption was made that all of the fenitrothion present in the surface water following spray drift, as appropriate, partitioned immediately to the sediment phase. Values shown below are for total fenitrothion using RT50 of 88.1 days and spray drift values appropriate for a 1 or 3m buffer zone.
Application rate	750 g a.s/ha (x 4 applications for outdoor tomatoes and x 3 applications for vines). Spray drift. (Assumed 77th percentile spray drift for multiple application, 90th percentile spray drift for single application).

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Outdoor Tomatoes (1 m buffer zone)

PEC$_{(sed)}$	Single application (mg/kg) Actual	Single application (mg/kg) Time weighted average	Multiple application (mg/kg) Actual	Multiple application (mg/kg) Time weighted average
Initial	0.1598	-	0.4014	/
Short term 24 h	0.1596	0.1597	0.3990	0.4002
2d	0.1590	0.1595	0.3963	0.3989
4d	0.1572	0.1588	0.3906	0.3962
Long term 7d	0.1539	0.1574	0.3818	0.3919
14d	0.1458	0.1540	0.3614	0.3817
21d	0.1380	0.1499	0.3421	0.3717
28d	0.1306	0.1460	0.3237	0.3620
50d	0.1098	0.1345	0.2723	0.3335

Vines (3 m buffer zone)

PEC$_{(sed)}$	Single application (mg/kg) Actual	Single application (mg/kg) Time weighted average	Multiple application (mg/kg) Actual	Multiple application (mg/kg) Time weighted average
Initial	0.4627	/	1.0865	/
Short term 24 h	0.4620	0.4625	1.0805	1.0836
2d	0.4603	0.4618	1.0737	1.0804
4d	0.4551	0.4598	1.0587	1.0733
Long term 7d	0.4456	0.4558	1.0349	1.0620
14d	0.4221	0.4459	0.9798	1.0346
21d	0.3995	0.4341	0.9273	1.0075
28d	0.3781	0.4227	0.8776	0.9812
50d	0.3180	0.3893	0.7381	0.9040

PEC (ground water) (Annex IIIA, point 9.2.1)

Method of calculation and type of study (*e.g.* modelling, monitoring, lysimeter)	Modelling using FOCUS-PEARLv.1.1.1 for a 26 year run. Soil and climate scenarios as defined by FOCUS 2000: For vines (Chateaudun, Hamburg, Kremsmuster, Piacenza, Porto, Sevilla, Thiva). For tomatoes (Piacenza, Porto, Sevilla, Thiva). 2 simulations: (1) maximum total dose applied as a

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

	single application. Encapsulated fenitrothion assumed to be released as free fenitrothion with 50% release rate of 250 days and transformation factor of 1.0. Free fenitrothion assumed to degrade to NMC with transformation factor of 0.445. (2) Free fenitrothion and NMC modelled separately. All fenitrothion assumed to be available for degradation upon application. Multiple applications made at 14 day spray intervals. Simulation 1 Encapsulated fenitrothion: First order DT_{50lab} (20°C) of 250 d (preliminary work on rate of release of fenitrothion from capsules in soil); Nominal K_{F_OM} of 10,000 dm³/kg), 1/n of 0.9 Free fenitrothion: Average DT50lab (20°C) of 2.7 d refitted to first order (n = 4 soils); Worst case K_{oc} of 252 ml/g (K_{F_OM} of 146.2 dm³/kg), 1/n of 0.97 (n=3) NMC: Average DT50lab (20°C) of 3.1 d refitted to first order (n = 4 soils); Average K_{oc} of 285 ml/g (K_{F_OM} of 165.3 dm³/kg), 1/n of 0.76 (n=3). Simulation 2 Degradation rate, Koc and Kom as above for free fenitrothion and NMC.
Application rate	(Simulation 1) Single application: to tomatoes of 3.0 kg a.s./ha (4 x 750 g a.s./ha), with 80% crop interception (soil loading 0.6 kg a.s./ha), made on dates from 3 June to 13 August. To vines of 2.25 kg a.s./ha (3 x 750 g a.s./ha), with 85% crop interception (soil loading of 0.338 kg a.s/ha), made on dates from 2 September to 2 November. (Simulation 2) Multiple applications: to tomatoes 4 applications of 0.75 kg a.s//ha, with 80% crop interception (giving a soil loading of 4 x 0.15 kg a.s/ha each), with 14 day spray interval. To vines: 3 applications of 0.75 kg a.s//ha, with 85% crop interception (giving soil loading of 3 x 0.1125 kg a.s/ha each).

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

	NMC: application rates corrected for the maximum amount of NMC formed in soil laboratory degradation studies (44.5% AR) and for molecular weight differences. Rates equated to 4 applications of 0.037 kg a.s/ha on tomatoes made on dates from 22 April to 13 August, and 3 applications of 0.028 kg a.s./ha on vines, made on 5 August to 2 November.

$PEC_{(gw)}$

Maximum concentration	Maximum concentration in all EU scenarios modelled of: Fenitrothion: <0.001 µg/l NMC <0.001 µg/l
Average annual concentration (Results quoted for modelling with FOCUS gw scenarios, according to FOCUS guidance)	Predicted 80th percentile concentration in all EU scenarios modelled of. Fenitrothion: <0.001 µg/l NMC <0.001 µg/l

Fate and behaviour in air (Annex IIA, point 7.2.2, Annex III, point 9.3)

Direct photolysis in air ‡	See below (photochemical oxidative degradation)
Quantum yield of direct phototransformation	7.98×10^{-4} at 313 nm (monochromatic light) Theoretical lifetime DT_{50}: 0.67 - 0.97 d (20°N) 0.68 - 1.7 d (40°N) 0.9 - 8.38 d (60°N)
Photochemical oxidative degradation in air ‡	DT_{50} of <6 hours derived by the Atkinson method of calculation.
Volatilization ‡	From plant surfaces: ‡ No data. Vapour pressure: 6.76×10^{-4} Pa at 20°C 1.57×10^{-3} Pa at 25°C (by interpolation) slightly volatile from soil: ‡ No data.

PEC (air)

Method of calculation	Assessment by RMS, based on vapour pressure, Henry's Law Constant, formulation type and half-life of fenitrothion in air.

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

PEC$_{(a)}$

Maximum concentration	Negligible

Definition of the Residue (Annex IIA, point 7.3)

Relevant to the environment	**Soil** Definitions for risk assessment: fenitrothion, NMC, AM-FNT (anaerobic metabolite), AA-FNT (anaerobic metabolite). Definitions for monitoring: fenitrothion, NMC (a new study with NMC and soil non-target micro-organisms was submitted but not evaluated. This study could provide new information to assess the ecotoxicological relevance of NMC) **Water** **Ground water** Definitions for risk assessment: fenitrothion, NMC Definitions for monitoring: fenitrothion **Surface water** Definition for risk assessment sediment: Fenitrothion and NMC. Definitions for risk assessment: fenitrothion, NMC, AM-FMT, DM-AM-FNT, Definitions for monitoring: fenitrothion **Air** Definitions for risk assessment: fenitrothion Definitions for monitoring: fenitrothion

Monitoring data, if available (Annex IIA, point 7.4)

Soil (indicate location and type of study)	Not available
Surface water (indicate location and type of study)	Not available
Ground water (indicate location and type of study)	Not available
Air (indicate location and type of study)	Not available

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Classification and proposed labelling (Annex IIA, point 10)

with regard to fate and behaviour data	Candidate for R53

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Appendix 1.6: Effects on non-target Species

Effects on terrestrial vertebrates (Annex IIA, point 8.1, Annex IIIA, points 10.1 and 10.3)

Acute toxicity to mammals ‡	330 mg a.s./kg bw (8800 mg a.s./kg bw – formulation)
Acute toxicity to birds ‡	2.3 mg a.s./kg bw/day (40 ppm)
Dietary toxicity to birds ‡	23 mg a.s./kg bw (47.1 mg a.s./kg bw – formulation)
Reproductive toxicity to birds ‡	54.19 mg a.s./kg bw (122 ppm) – formulation (126 ppm – a.s.*)
	2.34 mg a.s./kg bw (20 ppm)

* Daily dose calculations not available.

Toxicity/exposure ratios for terrestrial vertebrates (Annex IIIA, points 10.1 and 10.3)

Application rate (kg as/ha)	Crop	Category (*e.g.* insectivorous bird)	Time-scale	TER	Annex VI Trigger
0.75	Orchard/vine/hops	Insectivorous bird	Acute	**0.6**	10
0.75	Orchard/vine/hops	Insectivorous bird	Short-term	**2.4**	10
0.75	Orchard/vine/hops	Insectivorous bird	Long-term	**0.1**	5
0.75	Orchard/vine/hops	Herbivorous mammal	Acute (a.s.)	**2.9**	10
0.75	Orchard/vine/hops	Herbivorous mammal	Acute (formulation)	191	10
0.75	Leafy crops	Insectivorous mammal	Acute (a.s.)	49.8	10
0.75	Leafy crops	Insectivorous mammal	Acute (formulation)	3323	10
0.75	Leafy crops	Herbivorous mammal	Long-term	**0.06**	5
0.75	Leafy crops	Insectivorous mammal	Long-term	**0.9**	5
0.75	Leafy crops	Earthworms (bird)	Acute	31	10
0.75	Leafy crops	Earthworms (bird)	Short-term	52	10
0.75	Leafy crops	Earthworms (bird)	Long-term	**0.6**	5
0.75	Leafy crops	Earthworms (mammal)	Acute (a.s.)	440	10
0.75	Leafy crops	Earthworms (mammal)	Acute (formulation)	29333	10

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Application rate (kg as/ha)	Crop	Category (*e.g.* insectivorous bird)	Time-scale	TER	Annex VI Trigger
0.75	Leafy crops	Earthworms (mammal)	Long-term	**0.6**	5

Toxicity data for aquatic species (most sensitive species of each group) (Annex IIA, point 8.2, Annex IIIA, point 10.2)

Group	Test substance	Time-scale	Endpoint	Toxicity (mg/l)
Laboratory tests ‡				
Oncorhynchus mykiss	Technical fenitrothion	Acute	LC_{50} (96h)	1.3 mg a.s./l
Daphnia magna	Technical fenitrothion	Acute	EC_{50} (48h)	0.0086 mg a.s./l
Selenastrum capricornutum	Technical fenitrothion	Acute	EbC50 (72h)	1.3 mg a.s./l
Oncorhyncus mykiss	Technical fenitrothion	Chronic	NOEC (96 days)	0.088 mg a.s./l
Daphnia magna	Technical fenitrothion	Chronic	NOEC (21 days)	0.087 µg a.s./l
Oncorhynchus mykiss	IPM 400	Acute	LC_{50} (96h)	> 2.1 mg a.s./l
Chironomus riparius	IPM 400	Chronic	NOEC	1.7 µg a.s./l
Daphnia magna	AM-FNT	Acute	EC_{50} (48h)	5.8 mg metabolite/l
Daphnia magna	NMC	Acute	EC_{50} (48h)	18 mg metabolite/l

Microcosm or mesocosm tests
Microcosm study conducted with Daphnia magna – NOEAEC = 0.17 µg a.s./l.

Toxicity/exposure ratios for the most sensitive aquatic organisms (Annex IIIA, point 10.2)

Application rate (kg as/ha)	Crop	Organism	Time-scale	Distance (m)	TER	Annex VI Trigger
0.75	Tomato	*O. mykiss*	Acute	200	15294	100
0.75	Tomato	*D. magna*	Acute	200	101	100
0.75	Tomato	*S. capricornutum*	Acute	200	15294	10
0.75	Tomato	*O. mykiss*	Chronic	250	1294	10
0.75	Tomato	*D. magna*	Chronic	250	**1.3**	10
0.75	Tomato	*C. riparius*	Chronic	250	25	10
0.75	Grapevine	*O. mykiss*	Acute	200	17567	100

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Application rate (kg as/ha)	Crop	Organism	Time-scale	Distance (m)	TER	Annex VI Trigger
0.75	Grapevine	*D. magna*	Acute	200	116	100
0.75	Grapevine	*S. capricornutum*	Acute	200	17567	10
0.75	Grapevine	*O. mykiss*	Chronic	250	2200	10
0.75	Grapevine	*D. magna*	Chronic	250	**2.2**	10
0.75	Grapevine	*C. riparius*	Chronic	250	42.5	10
0.75	Tomato (AM-FNT)	*D. magna*	Acute	1	35042	100
0.75	Tomato (NMC)	*D. magna*	Acute	3	111043	100
0.75	Grapevine (AM-FNT)	*D. magna*	Acute	1	13146	100
0.75	Grapevine (NMC)	*D. magna*	Acute	3	41792	100

Bioconcentration

Bioconcentration factor (BCF) ‡	29
Annex VI Trigger:for the bioconcentration factor	100
Clearance time (CT_{50}) (CT_{90})	0.19 0.62
Level of residues (%) in organisms after the 14 day depuration phase	No ^{14}C residues detected in whole fish after the 14 day depuration phase

Effects on honeybees (Annex IIA, point 8.3.1, Annex IIIA, point 10.4)

Acute oral toxicity (a.s.) ‡	0.20 µg a.s./bee
Acute contact toxicity (a.s.)‡	0.16 µg a.s./bee
Acute oral toxicity (formulation)‡	16.48 µg a.s./bee
Acute contact toxicity (formulation)‡	9.38 µg a.s./bee

Hazard quotients for honey bees (Annex IIIA, point 10.4)

Application rate (kg as/ha)	Crop	Route	Hazard quotient	Annex VI Trigger
Laboratory tests				
0.75	Tomato	Oral	3750	50
0.75	Tomato	Contact	4687.5	50

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Application rate (kg as/ha)	Crop	Route	Hazard quotient	Annex VI Trigger
0.75	Tomato	Oral (formulation)	**45.5**	50
0.75	Tomato	Contact (formulation)	80	50

Field or semi-field tests

A number of higher-tier studies were submitted. These were conducted to support the use of the product in Italy and were not conducted using the proposed crops. Additionally, the studies were not GLP compliant. It appears effects on bees can persist for up to 7 days, with bees being more at risk during flowering of the crop. The micro-capsules can be taken by the bees but this is more likely to occur during flowering when bees are more active in the crop. When applied pre-flowering bees are unlikely to confuse the micro-capsules with pollen.

As transient mortality of bees is likely to occur following an application of 'IPM 400' risk mitigation measures may be required at MS level to protect bees.

Effects on other arthropod species (Annex IIA, point 8.3.2, Annex IIIA, point 10.5)

Species	Stage	Test Substance	Dose (kg as/ha)	Endpoint	Effect	ESCORT 2 Trigger
Laboratory tests‡						
A. rhopalosiphi (aged residue)	Adult	IPM 400	2 x 715 g a.s./ha + 2 x 750 g a.s./ha	Mortality, fecundity	After 42 days mean corrected % mortality: 10.82 Mean no. mummies/female: 29.1	50%
T. pyri (extended)	Proto-nymphs	IPM 400	1500 g a.s./ha	Mortality, fecundity	Mean % corrected mortality : 5.6% Mean no. offspring/female: 10 ± 2.2 No reduction in fecundity observed.	50%
O. laevigatus (aged residue)	Larvae	IPM 400	2 x 715 g a.s./ha + 2 x 750 g a.s./ha	Mortality, fecundity	After 7 days % corrected mortality: 35.29 % reduction in reproduction rate:	50%

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Species	Stage	Test Substance	Dose (kg as/ha)	Endpoint	Effect	ESCORT 2 Trigger
					17.79 % reduction in hatching rate: 8.45	
C. carnea (aged residue)	Larvae	IPM 400	2 x 715 g a.s./ha + 2 x 750 g a.s./ha	Mortality, fecundity	After 7 days Mean corrected % mortality: 27.7 Mean no. eggs/female/day: 29.84 % hatching rate: 94.29%	50%

Field or semi-field tests
None to GLP.

Effects on earthworms (Annex IIA, point 8.4, Annex IIIA, point 10.6)

Acute toxicity ‡	231.0 mg a.s./kg soil
Acute toxicity (NMC)‡	35 mg metabolite/kg soil
Reproductive toxicity ‡	2.5 mg a.s./kg soil - formulation

Toxicity/exposure ratios for earthworms (Annex IIIA, point 10.6)

Application rate (kg as/ha)	Crop	Time-scale	TER	Annex VI Trigger
0.75	Tomato	Acute	111	10
0.75	Tomato (NMC)	Acute	875	10
0.75	Tomato	Chronic	**1.2**	5

Effects on soil micro-organisms (Annex IIA, point 8.5, Annex IIIA, point 10.7)

Nitrogen mineralization ‡	No effect at 10 mg a.s./kg soil - formulation
Carbon mineralization ‡	No effect at 10 mg a.s./kg soil - formulation

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

Classification and proposed labelling (Annex IIA, point 10)

with regard to ecotoxicological data	N	Dangerous for the environment
	R50/53:	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

‡ Endpoints identified by EU-Commission as relevant for Member States when applying the Uniform Principles

APPENDIX 2 – ABBREVIATIONS USED IN THE LIST OF ENDPOINTS

ADI	acceptable daily intake
AOEL	acceptable operator exposure level
ARfD	acute reference dose
a.s.	active substance
bw	body weight
CA	Chemical Abstract
CAS	Chemical Abstract Service
CIPAC	Collaborative International Pesticide Analytical Council Limited
d	day
DAR	draft assessment report
DM	dry matter
DT_{50}	period required for 50 percent dissipation (define method of estimation)
DT_{90}	period required for 90 percent dissipation (define method of estimation)
ε	decadic molar extinction coefficient
EC_{50}	effective concentration
EEC	European Economic Community
EINECS	European Inventory of Existing Commercial Chemical Substances
ELINKS	European List of New Chemical Substances
EMDI	estimated maximum daily intake
ER50	emergence rate, median
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FOCUS	Forum for the Co-ordination of Pesticide Fate Models and their Use
GAP	good agricultural practice
GCPF	Global Crop Protection Federation (formerly known as GIFAP)
GS	growth stage
h	hour(s)
ha	hectare
hL	hectolitre
HPLC	high pressure liquid chromatography or high performance liquid chromatography
ISO	International Organisation for Standardisation
IUPAC	International Union of Pure and Applied Chemistry
K_{oc}	organic carbon adsorption coefficient
L	litre
LC	liquid chromatography
LC-MS	liquid chromatography-mass spectrometry
LC-MS-MS	liquid chromatography with tandem mass spectrometry
LC_{50}	lethal concentration, median

LD_{50}	lethal dose, median; dosis letalis media
LOAEL	lowest observable adverse effect level
LOD	limit of detection
LOQ	limit of quantification (determination)
µg	microgram
mN	milli-Newton
MRL	maximum residue limit or level
MS	mass spectrometry
NESTI	national estimated short term intake
NIR	near-infrared-(spectroscopy)
nm	nanometer
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NOEL	no observed effect level
PEC	predicted environmental concentration
PEC_A	predicted environmental concentration in air
PEC_S	predicted environmental concentration in soil
PEC_{SW}	predicted environmental concentration in surface water
PEC_{GW}	predicted environmental concentration in ground water
PHI	pre-harvest interval
pK_a	negative logarithm (to the base 10) of the dissociation constant
PPE	personal protective equipment
ppm	parts per million (10^{-6})
ppp	plant protection product
r^2	coefficient of determination
RPE	respiratory protective equipment
STMR	supervised trials median residue
TER	toxicity exposure ratio
TMDI	theoretical maximum daily intake
UV	ultraviolet
WHO	World Health Organisation
WG	water dispersible granule
yr	year