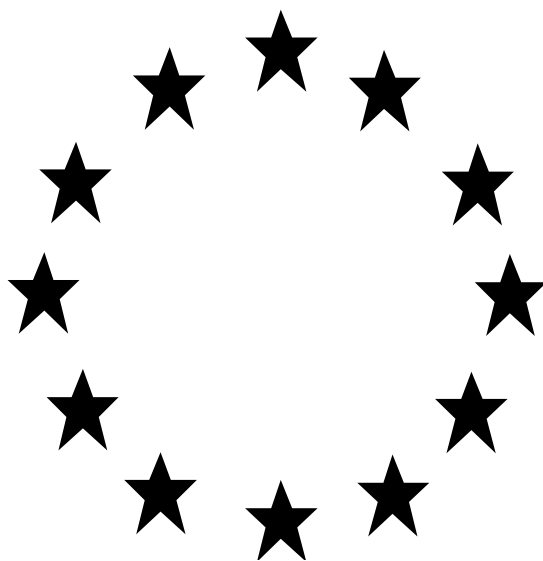




Additional Report to the DAR

- public version -

**Risk assessment provided by the rapporteur Member State
Italy for the existing active substance**

CHLOROPICRIN

**upon resubmission in the framework of the accelerated procedure in
accordance with Commission Regulation (EC) No 33/2008**

Volume 1

March 2010

**Ministry of Health
Rome
Italy**

**Addendum to Draft Assessment Report
regarding resubmission of Chloropicrin**



Chloropicrin

Volume 1

**REPORT AND PROPOSED DECISION OF
ITALY MADE TO THE EUROPEAN
COMMISSION UNDER 91/414/EEC**

March 2010

Coordinator

Dr. Roberto Dommarco Istituto Superiore di Sanità (I.S.S.) - Roma

Editorial Board

Dr. Renato Cabella Istituto Superiore di Sanità (I.S.S.) - Roma
Dr. Emma Di Consiglio Istituto Superiore di Sanità (I.S.S.) - Roma
Dr. Luca Fava Istituto Superiore di Sanità (I.S.S.) - Roma
Dr. Silvia Marchini Istituto Superiore di Sanità (I.S.S.) - Roma
Dr. Maria Antonietta Orrù Istituto Superiore di Sanità (I.S.S.) - Roma
Dr. Tiziana Generali Istituto Superiore di Sanità (I.S.S.) - Roma

WARNING: This document forms part of an EC evaluation data package and should not be read in isolation. Registration must not be granted on the basis of this document.

LEVEL I

CHLOROPICRIN

STATEMENT OF THE SUBJECT MATTER AND PURPOSE OF MONOGRAPH

WARNING: This document forms part of an EC evaluation data package and should not be used in isolation. Registration must not be granted on the basis of this document.

1.1 Purpose for which the monograph was prepared

This monograph on the evaluation of Chloropicrin was prepared for the submission to the Italian Ministero della Sanità to enable a decision to be made on the listing of Chloropicrin in Annex I of the Directive 91/414/EEC.

The Draft Assessment Report was submitted to EFSA in April 2006. Following the entry into force of Commission Regulation 1095/2007, the European Chloropicrin Group (ECG), the notifier, chose to voluntarily withdraw their Chloropicrin Dossier from the review process. Chloropicrin was not included in Annex I of Directive 91/414/EEC as stated in Commission Directive 2008/934/EC. In June 2009, ECG submitted their re-submission Dossier according to the Commission deadline. In the re-submission dossier, the notifier proposes to limit the application of the product to the soil injection whereas in the original submission assessed in the DAR of 2005 the requested methods of applications were soil injection and drip irrigation.

This addendum to the DAR from 2006 is based on the information provided by the notifier in the re-submission Dossier according to Regulation 2008/33/EC. The notifier based their re-submission Dossier on the comments made in the DAR and made by the MS during the review of the DAR prior to the issuance of Regulation 1095/2007.

1.2 Identity of the active substance (Annex IIA 1)

1.2.1 Name and address of the applicant for inclusion of the active in Annex I (Annex IIA 1.1)

Name: European Chloropicrin Group
Address: 1805-45th Street N.W., Washington D.C., 20007-2070,
U.S.A.

Contact name: [REDACTED]
Contact address: [REDACTED]
Telephone number: [REDACTED]
Telefax number: [REDACTED]

EU contact company: Rivendell Consulting Ltd
EU contact company address: Rivendell House, Stamullen, Co.Meath, Ireland
EU contact name: [REDACTED]
Telephone number: [REDACTED]
Telefax number: [REDACTED]
e-mail: [REDACTED]
Alternative EU contact name: [REDACTED]
Telephone number: [REDACTED]
e-mail: [REDACTED]

1.2.2 Manufacturers of the active substance (Annex IIA 1.2)

Name: [REDACTED]
Address: [REDACTED]
Contact name: [REDACTED]
Telephone number: [REDACTED]
Telefax number: [REDACTED]
Location of plants: [REDACTED]

28345, USA

1.2.3 Common name and synonyms (Annex IIA 1.3)

Chloropicrin (BSI, E-ISO, ESA)
Chloropicrine (F-ISO)

1.2.4 Chemical name (Annex IIA 1.4)

IUPAC, CA: Trichloronitromethane
CAS: Methane, nitrotrichloro

1.2.5 Manufacturer's development code number (Annex IIA 1.5)

The company has no code names for the product

1.2.6 CAS, EEC and CIPAC Numbers (Annex IIA 1.6)

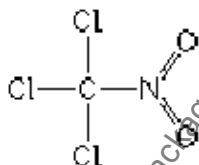
CAS: 76-06-2
EEC: 200-930-9
CIPAC: 298

1.2.7 Molecular and structural Formula, molecular mass (Annex IIA 1.7)

Molecular Formula

CCl_3NO_2

Structural Formula



Molecular Mass

164.4

1.2.8 Method or methods of manufacture (Annex IIA 1.8)

See Annex C

1.2.9 Specification of purity of the active substance (Annex IIA 1.9)

>990 g/kg

1.2.10 Identity of isomers, impurities and additives (Annex IIA 1.10)

See Annex C

1.2.11 Analytical profile of batches (Annex IIA 1.11)

See Annex C

1.3 Identity of the plant protection product (Annex IIIA.1)

1.3.1 Name and address of applicant and manufacturer of the plant protection product (Annex IIIA 1.1, 1.2)

Applicant

Name: European Chloropicrin Group
Address: 1805-45th Street N.W., Washington D.C. 20007-2070,
U.S.A.

Contact name: [REDACTED]
Contact address: [REDACTED]
Telephone number: [REDACTED]
Telefax number: [REDACTED]

EU contact company: Rivendell Consulting Ltd
EU contact company address: Rivendell House, Stamullen, Co.Meath, Ireland
EU contact name: [REDACTED]
Telephone number: [REDACTED]
Telefax number: [REDACTED]
e-mail: [REDACTED]
Alternative EU contact name: [REDACTED]
Telephone number: [REDACTED]
e-mail: [REDACTED]

Manufacturer

Name: [REDACTED]
Address: [REDACTED]
Contact name: [REDACTED]
Telephone number: [REDACTED]
Telefax number: [REDACTED]
Location of plants: [REDACTED]

1.3.2 Current, former and proposed trade names and development code numbers (Annex IIIA 1.3)

Please refer to the DAR from 2006.

1.3.3 Composition of the plant protection product (Annex IIIA 1.4)

Please refer to the DAR from 2006.

1.3.4 Type of the preparation and code (Annex IIIA 1.5)

Please refer to the DAR from 2006.

1.3.5 Function (Annex IIIA 1.6, Annex IIA 3.1)

Fungicide, insecticide, nematocide, bactericide

1.4 Use of the plant protection product – vapour releasing product VP (Chloropicrin 99)

1.4.1 Field of use (Annex IIIA 3.1, Annex IIA 3.3)

Agriculture, Horticulture

1.4.2 Effects on harmful organism (Annex IIIA 3.2, Annex IIA 3.2)

Chloropicrin applied to the soil comes in contact with soil fungi, micro organisms, insects, and bacteria. The specific mode of action is not understood, but Chloropicrin is a strong irritant that is very toxic to all biological systems; affecting body surfaces and interfering with the respiratory system and the cellular transport of oxygen.

1.4.3 Summary of intended uses (Annex IIIA 3.3, 3.4, 3.7; Annex IIA 3.4)

Chloropicrin is a fungicide, insecticide, nematocide and bactericide applied to the soil pre-planting for the control of various fungal disease, nematodes and germinating weed seeds.

See Table 1 section 1.4.3.1 Details of intended use.

WARNING: This document forms part of an EC evaluation data package and should not be read in isolation. Registration must not be granted on the basis of this document.

1.4.3.1 Details of intended use (Annex IIIA 3.3, 3.4, 3.7, Annex IIA 3.4)

Table 1.4.3.1-1: Harmful organism controlled

Crop	Disease
Tomatoes	<i>Fusarium, Verticillium, Rhizoctonia, Phytophthora, Pyrenochaeta, Pythium, Sclerotinia, Sclerotium, Didymella, and Armillaria.</i>
	Organisms
	<i>Nematodes</i> <i>Insects</i> <i>Germinating weed seeds</i>

1.4.3.1 Table 1.4.3.1-2: Summary of intended use

Crop	Country	Rate kg as/ha/application	Rate product l/ha application	Rate as/ha/crop	Rate product l/ha/crop	N° of application /crop	Growth stage of the weed at application	PHI	Spray interval in days	Spray conc.
Tomato Pre-planting (f)	UK	Up to 448	Up to 272	Up to 448	Up to 272	1	N/A	N/A	N/A	-
Tomato Pre-planting (f)	Italy	Up to 448	Up to 272	Up to 448	Up to 272	1	N/A	N/A	N/A	-
Tomato Pre-planting (f)	Spain	Up to 448	Up to 272	Up to 448	Up to 272	1	N/A	N/A	N/A	-
Tomato Pre-planting (f)	Greece	Up to 448	Up to 272	Up to 448	Up to 272	1	N/A	N/A	N/A	-
Tomato Pre-planting (f)	Belgium	Up to 448	Up to 272	Up to 448	Up to 272	1	N/A	N/A	N/A	-

f - field use

1.4.3.2 Application rate (Annex IIIA, 3.4)

The maximum application rate is 272 l/ha, which is equivalent to 448 kg as/ha, as a soil applied pre-planting treatment to control fungi such as *Fusarium*, *Verticillium*, *Rhizoctonia*, *Phytophthora*, *Pyrenochaeta*, *Pythium*, *Sclerotinia*, *Sclerotium*, *Didymella*, and *Armillaria* and to control other soil borne pests or organisms.

1.4.3.3 Concentration of the active substance in material used (Annex IIIA 3.5)

The maximum dose for soil treatment is: 45 g product/m² = 45 g as/m²

1.4.3.4 Method of application (Annex IIIA 3.6)

The notifier provided a more detailed explanation of the method application of Chloropicrin by soil injection.

Chloropicrin is applied directly into soil with specialized equipment through shanks pulled behind a tractor (Shank injection) Chloropicrin is supplied directly from the manufacturer to professional applicators and is applied from a returnable steel cylinder (see pictures 1 + 2).



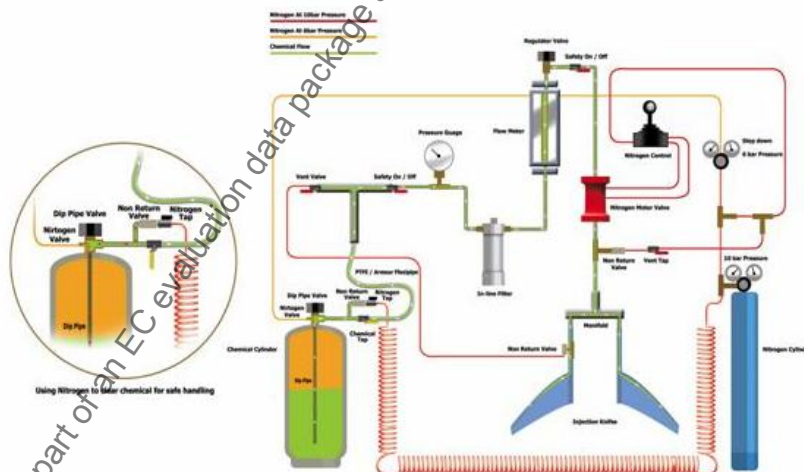
Picture 1



Picture 2

Equipment used for application of Chloropicrin to the soil use nitrogen, an inert gas, under low-pressure to push liquid Chloropicrin through a closed application system. Treatment lines are securely connected and tested for leaks prior to the introduction of Chloropicrin. Chloropicrin passes from the cylinder through reinforced braded steel hose or copper pipes, valves, and filters.

The product then passes through a “flow meter” used as a gauge to regulate the predetermined amount that is applied to the soil beneath a retentive “barrier” film designed specifically for this purpose (see picture 3). Specially trained professional applicators maintain control of the rate at which Chloropicrin is applied and keep a constant vigil throughout the treatment period. On completion of an application, the rig is purged, the cylinder sealed with all the valves closed in sequence, and delivery lines are depressurized into the soil and beneath the retentive film.

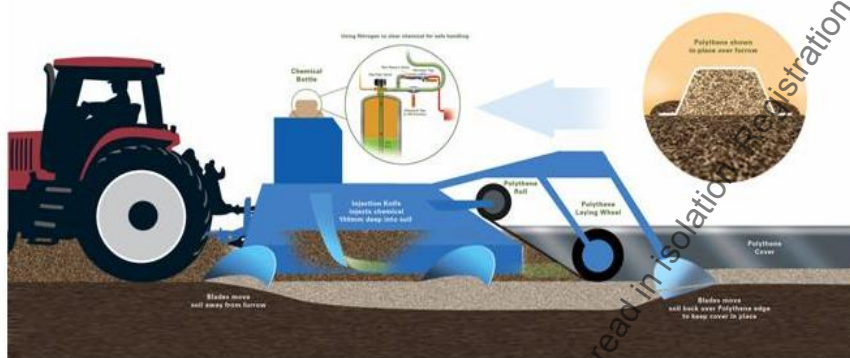


Picture 3

A custody program has been put in place to manage and audit the supply, storage, distribution and safe use of Chloropicrin. The program involves tracking cylinders through the supply chain from the Manufacturer to the applicator. This program includes the training and qualifying of professional fumigators. In this way Chloropicrin is managed and applied by a restricted number of individuals specifically qualified for this task.

Application by soil injection:

- This treatment is carried out using a tractor-mounted rig that simultaneously lays the virtually impermeable barrier film whilst applying the Chloropicrin.
- The tractor is regulated to a constant speed in order to stabilise the application rate. This speed is equivalent to walking speed.
- Inert N₂ gas is used to stabilise the pressure of the flow and to flush the delivery system.
- Chloropicrin cylinders are secured to a tractor on specially designed racks. Once a cylinder is opened and the system is charged with nitrogen, the product passes through a flow meter and control valves, then passes through additional lengths of hose or piping to the injection shanks, which are pulled by the tractor through the soil (see picture 4).



Picture 4

- Prior to the start of application, the injection shanks are placed in the soil to a depth of 20cm. The plough shears/discs used to bury the edges of the barrier film, used to retain the product following injection, are also adjusted to a depth of 25/30cm.
- As the tractor pulls forward, the flow of fumigant is turned on. Simultaneous to the injection process the barrier film is unrolled (see picture 5).

The front plough shear/disc of the rig creates furrows in which the sides of the roll of barrier film are pinned with the rear plough shear/disc covering the barrier film edges with soil and sealing the fumigant in the treatment zone.



Picture 5

- When the front of the tractor reaches the end of the treatment row the fumigant flow is

switched off and the delivery system purged into the soil.

- The roll of barrier film is cut and buried.
- The tractor is turned around and set adjacent to the previous pass and the process is repeated. Each successive pass of barrier film is simultaneously glued to the previous pass, as it travels down the field, by means of a specialized gluing apparatus on the tractor.
- The last row to be treated is used to completely purge the delivery system into the soil before the tractor leaves the field.
- Empty cylinders are secured and returned to the manufacturer.

Table 1 outlines a summary of the uses of Chloropicrin to be considered as part of the 91/414/EEC submission.

Table 1.4.3.4-1: Summary of Application Processes used for Chloropicrin

Application Process	Full Field/ Partial Field	Maximum Application Rate	Duration of Tarping	Pre-planting Interval from removal of tarp
Soil Injection	Full Field	448 kg/ha	8 days	7 – 14 days

1.1 Summary of Key Points

- Closed System – Regardless of application method all fumigants are applied through a Closed System
- Returnable Steel Cylinders – Fumigants are packaged in steel cylinders and returned to the formulator for refilling
- Cylinder Tracking System – An accounting of all fumigant cylinders is maintained
- Trained Personnel – Chloropicrin fumigant products are only supplied to and applied by trained individuals
- No Residues – Soil treatment is carried out prior to planting and leaves no chemical residues in crops
- Stewardship - Products are managed following prescribed procedures under controlled conditions:
 - Appropriate sites and weather
 - Properly prepared soil
 - Properly maintained and calibrated equipment
 - Careful consideration of worker and bystander safety

The notifier also submitted a letter from a UK distributor which explains the advantages of using Chloropicrin and which demonstrates that the explanation provided above is supported by actual use of the product.

1.4.3.5 Number and timing of application and duration of protection (Annex IIIA 3.7)

A maximum of 1 application is recommended at least at least 22 ± 2 days prior to planting of the treated area. Chloropicrin 99 has no long-lasting fumigation activity in soil, however, due to the high volatility of Chloropicrin 99, tarping of the soil is used to prolong its activity in the soil.

1.4.3.6 Proposed instructions for use (Annex IIIA 3.9)

Full details of the proposed instructions for use are included in the labels provided as part of Document C.

1.4.4 Information on authorization in EU Member State (Annex IIIA 12.1)

Full details of the current authorisation are presented in Table 1 Section 1.4.4.

WARNING: This document forms part of an EC evaluation data package and should not be read in isolation. Registration must not be granted on the basis of this document.

1.4.4 Information on authorization in EU Member State (Annex IIIA 12.1)

Table 1.4.4-1 Summary of Authorised Uses and Actual Uses

Authorised uses (crops, harmful organisms, rates of application, number of applications, timing of applications – growth stages and where appropriate, season)	Actual uses, if current practice is known to deviate from the authorised uses (crops, harmful organisms, rates of application, number of applications, timing of applications – growth stages and where appropriate, season)
1.1.1.1 UK Soil fumigation (>99% Chloropicrin)-outdoor cultivation. All crops; fungi, weeds, nematodes and soil borne pests; up to 448 kg/ha; preplanting. Crops planted on pre-treated soils are: strawberries, top fruit and outdoor hardy ornamentals.	In each European member state, current actual use or practice is not known to deviate from the authorised uses.
1.1.1.2 Belgium Soil fumigation (>99% Chloropicrin) All crops; fungi, weeds, nematodes and soil borne pathogens; up to 448 kg/ha; preplanting.	
1.1.1.3 Greece Pre-planting soil fumigation (>99% Chloropicrin)-outdoor or glasshouse cultivation. Control of fungi, weeds, nematodes and soil borne pests; up to 448 kg/ha; preplanting. Crops planted on pre-treated soils are: tomato, aubergine, pepper plant, strawberry, melon and watermelon.	
1.1.1.4 Italy Soil fumigation (>99% Chloropicrin)-outdoor or glasshouse cultivation. Control of fungi, weeds, nematodes and soil borne pests; up to 448 kg/ha; preplanting. Crops planted on pre-treated soils are: strawberries, tomato, aubergine, pepper plant, melon, watermelon and courgette.	
1.1.1.5 Spain Technical active substance (>99% Chloropicrin) for use in the formulation of plant protection products.	

LEVEL II

CHLOROPICRIN

REASONED STATEMENT OF OVERALL CONCLUSION DRAWN BY THE RAPPORTEUR MEMBER STATE

WARNING: This document forms part of an EU evaluation data package and should not be read in isolation. Registration must not be granted on the basis of this document.

2.1 Identity

All points of Annex IIA and IIIA have been addressed and the information supplied is acceptable.

2.2 Physical, chemical properties

Active substance

Chloropicrin is a colourless non-viscous liquid with a freezing point of -70°C and a vapour pressure of 2670 Pa at 20.8 °C. It is sparingly soluble in water (<0.01 g/ml at 25.7°C) and its partition coefficient of 2.5 would not suggest a high affinity for n-octanol. The photolytic degradation half-life is 31.1 hours at 25°C, pH 7 and the quantum yield is 0.5699. It does not dissociate in water, is not surface active and shows no flammable, oxidative or explosive properties.

Plant protection product

Chloropicrin 99 is a colourless liquid. It is non-explosive, non-autoflammable and has a flash point of >100°C. It has been shown to have a shelf life of >35 months at ambient temperatures. Its technical properties indicate that no particular problems are to be expected when used as recommended. It does not exhibit any oxidising properties.

2.3 Details of uses and further information

Chloropicrin is the active substance in Chloropicrin 99, a fungicide for pre-planting use in a variety of crops for the control of soil borne fungi and other diseases such as *Fusarium*, *Verticillium*, *Rhizoctonia*, *Phytophthora*, *Pyrenochaeta*, *Pythium*, *Sclerotinia*, *Sclerotium*, *Didymella*, and *Armillaria*. The specific mode of action is not understood, but Chloropicrin is a strong irritant that is very toxic to all biological systems, affecting body surfaces and interfering with the respiratory system and the cellular transport of oxygen.

Chloropicrin 99 may be applied a maximum of once per annum at 272 l/ha (448 kg as/ha). It is applied either by soil injection, and the soil is covered with tarp (tarpaulin) to contain the substance. Product application and tarp removal from treated areas, which occurs 8 days from application, must be effected by specialised operators. Between the time when tarp is removed from treated areas and the time when crops start to be sown or transplanted 14 days must elapse.

2.4 Proposals for the classification and labelling of the active substance and the formulated product

ACTIVE SUBSTANCE

Since the active substance and formulated product are the same in this case, the same classification applies to both.

Hazard symbol:	T+, N	Classification For labelling purposes
Indication of danger:	Very toxic Dangerous for the environment	
Risk Phrases:	R22 R26 R36/37/38 R48/22 R50/53	Harmful if swallowed Very toxic by inhalation Irritating to eyes, skin and respiratory system Harmful: danger of serious damage to health by prolonged exposure if swallowed Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
Safety Phrases:	S1/2 S4 S7 S9 S26 S36/37 S38 S45 S60 S61	Keep locked up. Keep out of the reach of children. Keep away from living quarters. Keep container tightly closed. Keep container in a well-ventilated place. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice Wear suitable gloves and protective clothing. In case of insufficient ventilation wear suitable respiratory equipment In case of accident or you feel unwell seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions / safety data sheets.

Additional risk and safety phrases required

In addition, all Plant Protection Products subject to 91/414/EC and the labeling requirements of 1999/45/EC should be accompanied by the phrase:

“To avoid risks to man and the environment, comply with the instructions for use”

Warning: this product contains an active substance very toxic to the aquatic environment. Carefully follow the recommended applications and doses.

FORMULATED PRODUCT

As the active substance is equivalent to the formulated product, the classification and labelling is identical.

2.5 Methods of analysis

2.5.1 Methods for analysis of the active substance as manufactured

Chloropicrin in technical production batches as manufactured is analysed by GC with detection by FID or MS, using chlorobenzene as internal standard.

2.5.2 Methods for formulation analysis

As the product, Chloropicrin 99, is equivalent to the active substance in this case, the methods described for the active substance can apply to both.

2.5.3 Methods for residue analysis

Residue analysis of Chloropicrin in crops, soil, water, air, urine, blood and body tissues is by gas chromatography with FID, ECD or mass selective (MS) detection.

For crops, Chloropicrin or its potential metabolite dichloronitromethane, is extracted with acidic acetone solution, acetone/phosphoric acid/sodium chloride and partitioned into iso-octane or hexane. The limit of quantification (LOQ) for Chloropicrin is 0.005 mg/kg for tomatoes.

For soil and water, Chloropicrin is extracted with acetonitrile and partitioned into hexane. The limit of quantification (LOQ) for Chloropicrin in soil is 0.05 mg/kg.

For air, Chloropicrin is extracted onto XAD-4 sampling tubes and desorbed into hexane. The limit of quantification (LOQ) for Chloropicrin in air is 0.1 µg/tube or 0.83 µg/m³.

For body fluids and tissues, Chloropicrin is extracted with acetone/phosphoric acid and partitioned into 2,2,4-trimethylpentane. Fresh urine is extracted directly with hexane. The limit of quantification (LOQ) for Chloropicrin in urine, blood, and tissues is 0.05 mg/L, 0.05 mg/L and 0.01 mg/kg, respectively.

2.6 Impact on human and animal health

2.6.1 Effect having relevance to human and animal health arising from exposure to the active substance or to impurities contained in the active substance or to their transformation products

Toxicological studies have been conducted on Chloropicrin, including studies of short-term toxicity, genotoxicity, chronic toxicity/carcinogenicity, reproduction and development toxicity as required under Directive 91/414/EEC.

In rats, Chloropicrin is rapidly (C_{max} : 6-24 h) and extensively absorbed (>85%), based on data on radioactivity recovered in expired air, urine and carcass and widely distributed to different tissues. The excretion is mainly due to expired air as ¹⁴CO₂ (approximately 60% of the low dose and 40-50% of the high dose). Elimination via urine accounted for 20% (low dose) to 30% (high dose) and via faeces accounted for 10-15% (both doses). Small amounts of total radioactivity were found in tissues (< 1% in each one), with the highest values measured in the stomach and liver. No significant differences were reported between single and repeated dose treatment and between genders.

The presence of ¹⁴CO₂ in expired air and of polar metabolites in urine, indicated that the test substance is extensively metabolised and converted into several polar metabolites which have not been identified. However, results from literature data indicate that Chloropicrin is rapidly dechlorinated to CHCl₂NO₂ with conversion of GSH to GSSG. It is also proposed that the GS-adduct intermediate could cleave, leading to raphanusamic acid. A minor pathway has been identified involving adduct formation with thiol proteins such as Hb-adduct. Chloropicrin is also metabolised into CHCl₂NO₂ and CH₂CINO₂ by liver microsomes and liver cytosol.

Chloropicrin is very toxic by the inhalation route. In accordance with the classification of the 22th Adaptation to Technical Progress (Council Directive 96/54 CE), the test compound classifies as "Very toxic by inhalation" and is ascribed the R phrase R26. Chloropicrin also classifies as "Harmful if swallowed" and is ascribed the R phrase R22. Chloropicrin has skin and eye irritancy properties, as documented by studies published in the open literature and in accordance with the classification of the 22th Adaptation to Technical Progress (Council Directive 96/54 CE), it is deemed appropriate to classify Chloropicrin as "Irritating to skin" with the R phrase R38 and "Irritating to eyes" with the R phrase R36. It is unlikely to be a skin sensitiser.

In a 90 day oral study performed in the rat, based on the clinical findings as well as the decreased body weights, the histopathological changes in the forestomach at 32 mg/kg, the NOAEL is to be considered 8 mg/kg/day.

In the 1-year dog study, the NOAEL value for oral toxicity was 0.1 mg/kg/day.

90 day inhalation studies were performed in the mouse and rat. Respiratory tissue is the main target for Chloropicrin inhalation toxicity. From the 90-day inhalation toxicity studies performed on rats and mice it has been established that respiratory tissue is the major target of toxic effects due to exposure to Chloropicrin vapour. Due to adverse effects occurring in the upper respiratory tissue of animals inhaling chloropicrin vapour at the lowest concentrations tested, that is 0.3 ppm (equivalent to 0.54 mg/kg/day for rats and 0.96 mg/kg/day for mice) a reliable NOAEL could not be determined from the key study.

In a 2-year oral toxicity and carcinogenicity study performed using rats a NOAEL in rats was determined to be 0.1 mg/kg/day. This was based on the incidence of epithelial hyperplasia and hyperkeratosis of the non-glandular stomach observed at the next highest dose level.

2 long term inhalation oncogenicity studies were carried out. The one in rats reported an NOAEL for toxic effects of 0.1 ppm (0.18 mg/kg bw). This is based on mortality and effects on body weight gain at higher dose levels.

From the long term inhalation study carried out in mice a NOAEL of 0.1 ppm (0.32 mg/kg bw) was established, based on the reported decreases in body weight and body weight gain as well as changes in the respiratory tract, including increases in lung weight and an increased incidence of several non-neoplastic lesions of the nasal cavities and lungs. Due to the lack of treatment related carcinogenic effects, the NOEL for oncogenicity was determined to be > 1.0 ppm (3.35 mg/kg bw).

Chloropicrin was tested for its genotoxic potential in a battery of *in vitro* and *in vivo* assays. Results from bacterial assay testing indicate that Chloropicrin caused a positive response with one tester strain (TA98) when tested in the presence of microsomal enzymes. A positive response was also obtained in a chromosome aberrations assay in CHO cells only when tested in the absence of microsomal enzymes. A gene mutation assay in cultured mammalian cells yielded a negative response. *In vivo* Chloropicrin did not show any evidence of causing chromosome damage when tested in a mouse micronucleus assay, in which the alteration of the PCE/NCE ratio provided evidence of target cells exposure. Moreover, Chloropicrin did not show any evidence of causing DNA damage when tested in a rat liver DNA repair (UDS) assay. Based on these findings, Chloropicrin is evaluated as non-genotoxic *in vivo*.

In a two-generation study in rats, Chloropicrin was administered at 0, 0.5, 1.0 and 1.5 ppm via whole body inhalation method.

There were no adverse effects on F1 or F2 offspring viability or growth observed at any exposure concentration in this study. The NOAEL of Chloropicrin when administered by whole-body inhalation to male and female rats was 1.0 ppm (equivalent to 1.80 mg/kg bw) with respect to systemic toxicity (F0 females) and greater than 1.5 ppm (equivalent to > 2.71 mg/kg bw) for development toxicity and reproductive performance. There was no systemic toxicity in the offspring of either generation.

In a rat whole-body inhalation toxicity study the No Observable Adverse Effect Level (NOAEL) for Chloropicrin when administered to mated female rats was judged to be 0.4 ppm (equivalent to 0.74 mg/kg bw), based on body weight loss and a decrease in food consumption, with respect to maternal systemic toxicity. When Chloropicrin was administered by whole-body inhalation exposure to mated female rats a NOAEL of 0.4 ppm (equivalent to 0.74 mg/kg bw) was established for developmental toxicity.

In a whole body inhalation teratogenicity rabbit study the no observable adverse effect level (NOAEL) of Chloropicrin when administered to inseminated females was 0.4 ppm with regard to maternal toxicity, based on deaths, clinical signs, necropsy findings, reduced body weight and food consumption and body weight loss at the higher exposure groups. The developmental NOAEL was established at 1.2 ppm based on reduced foetal body weight at 2 ppm.

The metabolite dichloronitromethane (CHCl_2NO_2) was found in levels of approximately 20% of the parent compound. Further considerations as determined by the European Commission Guidance Document on the Assessment of the Relevance of Metabolites in Groundwater for Substances Regulated under Council Directive 91/414/EEC have to be taking into account to assess the relevance of this metabolite in groundwater.

Considering the transient nature of dichloronitromethane, and similarity to its parent compound, its toxicological nature and the fact that it occurs as a 20% dechlorination breakdown product of Chloropicrin, it would be highly unlikely that this metabolite could be of any more concern than its parent compound.

In line with the European Commission Guidance Document on the Assessment of the Relevance of Metabolites in Groundwater for Substances Regulated under Council Directive 91/414/EEC, if a metabolite is found in animals and is less toxic than the parent, the acceptable limit may be defined starting from the ADI values derived for the parent compound (by using a conservative approach).

Following such an approach and based on the PEC_{gw} values, calculated for dichloronitromethane, a refined toxicological evaluation, with the availability of specific toxicity tests on the dichloronitromethane should be carried out to adequately address the risk assessment of the metabolite. In the absence of such a study, the possibility to re-consider some of the exposure scenario, requested for chloropicrin, is necessary.

In a human subject study, it was concluded that Chloropicrin behaves as a mild irritant at the concentrations studied over time and that sensory (ocular) irritation, the most sensitive indicator of exposure. The results showed that exposure to Chloropicrin vapour at or below concentrations of 75 ppb (0.075 ppm) is not likely to cause noticeable sensory irritation in the general population. The BMCL_{10} was derived for ocular irritation and represents the lower bound on a small percentage (10%) of a test population selected to represent the sensitive end of the general population. The BMCL_{10} for ocular symptoms was 0.073 ppm.

2.6.2 ADI

No suitable human data are available which would serve as a basis for setting an Acceptable Daily Intake (ADI) for Chloropicrin. The calculation of the ADI is therefore based on data from studies in laboratory animals. Results from all available toxicology studies on the test substance are considered. The ADI is derived using the most sensitive relevant effect in the most sensitive relevant animal model and an appropriate uncertainty factor. The lowest NOEL value of 0.1 mg/kg bw was obtained from a two year oral study in the rat. Applying a safety factor of 100 the proposed ADI is **1 µg/kg bw/day**.

2.6.3 ARfD (Acute Reference Dose)

The NOAEL (0.1 mg/kg/d) from the 1 year dog study was considered for ARfD calculation. Applying a safety factor of 100 the proposed **ARfD is 0.10 mg/kg bw/day/100 = 0.001 mg/kg bw**

2.6.4 Acceptable Operator Exposure Level

The Acceptable Operator Exposure Level (AOEL) is usually derived from the NOAELs in the most sensitive species in appropriate studies (short-term toxicity), divided by a safety factor.

In the case of Chloropicrin the following considerations need to be taken into account.

Three population groups are considered for setting an AOEL:

1. Operators – tractor drivers, tiller operators, tarp sealers and assistants during application
2. Re-entry workers - tractor drivers at tarp cutting, tarp removers and workers transplanting in soil
3. Bystanders – members of the public or assistants who may be in the vicinity of the treated plot

Groups 1 and 2 are likely to work for up to 8-hours a day but would be exposed to Chloropicrin vapour for not more than 6 hours per day for a few months per year. Individuals would potentially be subject to daily exposure over several days during the application period. Therefore, the AOEL needs to consider potential systemic toxicity from repeated exposure as well as portal of entry effects to the respiratory tract. Group 3 (bystanders) could potentially be close to the edge of treated plots and exposed to Chloropicrin vapour for periods of up to 1-hour as a conservative default. In this case an AOEL based on appropriate acute inhalation portal of entry effects is considered appropriate.

Groups 1 and 2, are subject to sensory irritation, portal-of-entry and possibly systemic respiratory risk. Accordingly the AOEL for occupational exposures is based on animal toxicology study findings. Acute inhalation exposure is the greatest risk concern for Group 3, bystanders, and they can be adequately protected by maintaining their exposure at or below the threshold level for transient eye sensory irritation. The human subject study completed at the [REDACTED] most closely resembles the acute bystander inhalation scenario (1-8 hours of exposure) for human health risk assessment. Eye irritation was the most sensitive endpoint determined for the sensitive subpopulation used in the human subject study, therefore, protecting against transient eye irritation would also protect against adverse irritation of the eyes, nose, and upper respiratory tract.

AOEL for operators and re-entry workers

The 90-day rodent inhalation studies are considered for establishing a systemic AOEL instead of the rat chronic study because the subchronic timeframe of the 90-day study is more appropriate for a fumigation applicator exposure scenario. In the key study (Point 5.3.6/01), a NOAEL could not be derived, a LOAEL of 0.3 ppm for rats (equivalent to 0.54 mg/kg bw/day) and 0.3 ppm for mice (equivalent to 0.96 mg/kg bw/day) was established. Therefore, the LOAEL to derive the AOEL is 0.3 ppm (2×10^{-3} mg/l) in the rat (equivalent to 0.54 mg/kg bw/day/day).

In deriving the AOEL a default position is used to account for uncertainties in extrapolation from toxicity data to the exposed human population. An assessment factor of 300 is used to account for interspecies variability (10X), for intraspecies variability (10X) and that the AOEL is based on a LOAEL rather than a NOAEL (3X).

Guidance on the establishment of a systemic AOEL (expressed in mg/kg bw/day) from animal inhalation studies is provided in the SANCO Guidance for the Setting and Application of Acceptable Operator Exposure Levels¹. By assuming 100% absorption of inhaled Chloropicrin and applying this guidance to the rat 90-day Chloropicrin inhalation study it is possible to express inhalation exposure as a systemic dose:

$$\begin{aligned}\text{LOAEL}_{\text{internal}} &= \text{LOAEC}_{\text{inhalation}} \times 45 \text{ l/kg bw/hr (rat respiration rate)} \times \text{daily} \\ &\quad \text{inhalation exposure} \\ &= 2 \times 10^{-3} \text{ mg/l} \times 45 \text{ l/kg bw/hr} \times 6 \text{ hr/day} \\ &= 0.54 \text{ mg/kg bw/day}\end{aligned}$$

Application of the proposed 300X Safety Factor results in a systemic AOEL of 0.002 mg/kg bw/day.

AOEL for bystander exposure

In the Human Subject Study with Chloropicrin it was established that sensory irritation of the eye is the most sensitive endpoint of Chloropicrin exposure and that it is a threshold event (IIA, 5.10/02). Since the human sensory irritation study showed that pulmonary inflammation does not appear to occur in humans even in the presence of sensory irritation, protection against sensory irritation in humans should be protective of respiratory system effects. Accordingly, a reasonable standard for short-term and intermediate-term exposure can be based on prevention of sensory irritation, the most sensitive endpoint of Chloropicrin exposure. A NOAEL of 0.075 ppm for eye irritation has been estimated based on all study data.

In deriving the AOEL for bystander a default position is used to account for uncertainties in extrapolation from toxicity data to the exposed human population. An assessment factor of 10 is used to account for interspecies variability. Application of the proposed 10X Safety Factor results in a systemic bystander AOEL of 0.0075 ppm.

2.6.5 Drinking Water Limit

In accordance with IPCS criteria (WHO, 1994), on the basis that exposure through drinking water should not account for more than 10 per cent of the ADI, assuming an average consumption of 2 litres of water per person per day and a body weight of 60 kg, a drinking water limit of 3 µg/l is appropriate for Chloropicrin.

The proposed DWL for Chloropicrin is therefore 3 µg /l.

2.6.6 Impact on human or animal health arising from exposure to the active substance or to impurities contained in it Operators, bystanders and workers

Operators

Operator exposure is preferably assessed on the basis of representative field studies. When no representative field studies are supplied operator exposure is usually estimated using both the German model [Uniform Principles for Safeguarding the Health of Applicators of Plant Protection Products (Uniform Principles for Operator Protection); Mitteilungen aus der

¹ EU (2006): Guidance for the Setting and Application of Acceptable Operator Exposure Levels (AOELs). SANCO 7531 – rev. 10

Biologischen Bundesanstalt für Land- und Forstwirtschaft, Berlin-Dahlem, no. 277, 1992] and the UK model ” (Predictive Operator Exposure Model (POEM), UK MAFF, 1992).

However, as Chloropicrin 99 is applied pre-planting to the bare soil for the control of various fungal disease nematodes and germinating weed seeds, by soil injection or drip irrigation application methods, neither of these models can be used for calculation of operator exposure.

Chloropicrin 99 contains 990g/kg of the active substance Chloropicrin. Chloropicrin is packaged in steel cylinders. A typical pack size is 28 kg (61L) cylinders. Chloropicrin 99 is applied with a single application per annum at a proposed maximum application rate of 272 l/ha (448 kg as/ha).

Two methods of application are proposed: soil injection and drip irrigation.

Product handling is restricted only to professional users. The application system is a closed system that does not require transfer of fumigant, which to a large extent mitigates operator exposure.

Injection application method

Chloropicrin 99 can be applied by direct injection into the soil using suitable fumigant application machines pulled by tractor, with delivering blades no more than 30 cm and cutting 15 cm into the soil. Soil must be covered with plastic films virtually impermeable to vapours (VIF), at the time of application. The VIF should be glued together, with the outer sides buried into the soil 15-20 cm deep. After the application the plastic cover must be maintained in place for at least 4-7 days. When removing the VIF, proceed first to lift the buried sides then, after 12-24 more hours, the whole plastic should be removed.

Five operator exposure field studies have been carried out which measure the levels of exposure to the operator during application of Chloropicrin.

The fifth and most appropriate study was conducted at an experimental field site located near Alessandria in northern Italy. Chloropicrin (99%) was applied to a test field system (2 ha) according to normal application practices (shank application technique), at a rate equivalent to 432 kg/ha, and then covered with a virtually impermeable film (VIF) for 7 days. On Day 7, the VIF was opened by cutting and on day 8, the VIF was completely removed.

Twelve air samplers were installed beyond the field margins, three on each compass point aspect of the plot in the middle of the respective edge, located 1, 20 and 50 m away from the field margins. Another sampling position was located away from the treated area (1250 m in a South East direction) as a control. Air samplers were positioned 150 cm above the ground. Sampling was conducted continuously for 14 days after application.

In addition to field sampling, three or four operators/workers were monitored by means of portable air sampling pumps during Chloropicrin application, VIF cutting and VIF removal.

Under the conditions of this study, Chloropicrin applied in a field at a rate of 432 kg/ha resulted in mean operator exposures to air of between 0.016 (assistant working mainly to side of plot) and 0.474 mg/m³ (tiller operator) during the application process. Chloropicrin was also measured in the air samples of the operators who were involved in opening or cutting of the VIF covering (Day 7) with between 0.018 (assistant working mainly to side of plot) and 0.303 mg/m³ (tractor driver) during this process. Finally, reduced Chloropicrin levels were measured in the air samples of the operators who were involved in removing the VIF covering

(Day 8) with between 0.0028 (assistant working mainly to side of plot) and 0.0088 mg/m³ (VIF remover) during this process.

In the air samples taken from the field margins continuously after application for 14 days levels of Chloropicrin were highest in the 1.5 m height sampling stations situated 1 m away from the treated field margins. The daily weighted mean (DWM) values were a maximum of 0.0491 mg/m³ on the day of application (day 1) reaching a DWM maximum of 0.1702 mg/m³ on day 4. There was a good correlation between the higher values observed to the orientation of the field with respect to the wind direction.

On days 12 to 14 no Chloropicrin was detected in any of the samples taken from 1 m, 20 m or 50 m away from the field margins.

Operators

The calculated systemic doses to workers (0.05925 mg/kg/day) were estimated from exposure to a concentration of 0.474 mg/m³ (worst case), for 6 hours per day, a breathing rate of 1.25 m³/hour, 100% absorption and a bodyweight of 60 kg. It is proposed to use the “assigned protection factors” (APF) as deduced by BSI and ANSI to calculate inhalation exposure loading. This was compared with the systemic AOEL as shown below:

Total Systemic Exposure 60 kg person (mg/kg bw/day)	RPE type	RPE reduction factor (APF)	% of AOEL (0.002 mg/kg bw/day)
3.555 / 60 = 0.05925	No RPE	-	2962%
3.555 / 60 = 0.05925	Half mask with gas filter	10 (x 0.1)	296%
3.555 / 60 = 0.05925	Full mask with gas filter	20 (x 0.05)	148%
3.555 / 60 = 0.05925	Power assisted full face gas filtering device (TM 3)	40 (x 0.025)	74%

Without the use of respiratory protection the worst case exposure would be 2962% of the AOEL. These results indicate that Chloropicrin can be used without potential risks to operators, only when a power assisted full face gas filtering device (TM 3) is worn.

Bystanders

Due to the nature of Chloropicrin, it is advised that bystanders are excluded from the area being treated. Only trained handlers should be permitted to the area during fumigation. Chloropicrin is injected directly into the ground, which is then immediately covered with tarp (VIF) for a period of 7-8 days, thus ensuring that exposure to workers or bystanders, either directly or through vapour transport is minimised. Despite this, it is of value to understand what potential risks may exist for a bystander in the vicinity of a field either being treated or having recently been treated with Chloropicrin. Existing exposure scenarios or models are not appropriate for estimating such potential risk but the field study summarised above measured environmental emissions of Chloropicrin and an assessment based on this study data is presented below.

Air samplers were installed at three distances (1, 20 and 50 m) from the field margins in the four cardinal directions and the concentration of Chloropicrin in the sampled air was measured continuously for 14 days after the application. From the study results, the worst

case air emission concentration of Chloropicrin occurred at 1, 20 and 50 m have been considered for assessment.

The maximum air concentration to which a bystander at 1 m to the treated area might have been exposed was 0.3077 mg/m³, or 0.046 ppm Chloropicrin. A conservative assumption for the duration of exposure is that a bystander may have been present for a period of 1 hour. The maximum level of 0.046 ppm is 613% of the bystander AOEL.

The maximum air concentration to which a bystander at 20 m to the treated area might have been exposed was 0.044 ppm Chloropicrin. A conservative assumption for the duration of exposure is that a bystander may have been present for a period of 1 hour. The maximum level of 0.044 ppm is 587% of the bystander AOEL.

The maximum air concentration to which a bystander at 50 m to the treated area might have been exposed was 0.0069 ppm Chloropicrin. A conservative assumption for the duration of exposure is that a bystander may have been present for a period of 1 hour. The maximum level of 0.0069 ppm is 92% of the bystander AOEL.

Using the alternative systemic AOEL approach, the calculated systemic dose to bystanders were estimated from exposure to maximum measured chloropicrin concentrations, for 1 hour per day, 100% absorption and a breathing rate of 1.25 m³/hour and a bodyweight of 60 kg. These were compared with the systemic AOEL as shown below:

Bystander distance from treated area (m)	Total Systemic Exposure – 60 kg person (mg/kg bw/day)	% of AOEL (0.002 mg/kg bw/day)
1	0.3846 / 60 = 0.0064	320%
20	0.37 / 60	308%
50	0.0583 / 60	49%

The exposure estimates shown above suggests that bystander exposure to Chloropicrin is below the proposed systemic AOEL for bystanders only when bystanders are located 50 m from the treated area.

Workers

Two scenarios are assessed:

1. Estimation of worker exposure by dermal contact with treated soil at time of transplanting.
2. Assessment of inhalation exposure of workers involved in activities post application, i.e. VIF cutting and VIF removal.

Estimation of worker exposure by dermal contact with treated soil at time of transplanting

At least 14 days must elapse between tarp removal and the time when the crops are sown or transplanted. Since Chloropicrin is volatile, it is proposed that only minimal residues will be left on the treated field surface when the workers enter the treated areas. As Chloropicrin is not intended for use by foliar application, it is not envisaged that exposure to DFRs will be a point of concern.

However, estimation of the potential for exposure to Chloropicrin residues that may be present in the topsoil at the time of transplanting when workers are involved in manual

activities can be considered using predicted soil residues and available surrogate transfer values.

The PEC soil value for the topsoil 14 days after injection treatment at the supported GAP is 16.7 mg/kg. This value can be used as a worst case assessment but it should again be noted that due to volatilisation the actual concentration available to workers manually touching the upper soil layer is likely to be much lower.

Data are available from the UK CRD (Guidance for Post-Application (Re-Entry Worker) Exposure Assessment) for scenarios where workers may be exposed to soil borne residues. Field studies investigating dermal exposure to soil by direct gravimetric measurements (Kissel et al)² suggest that an appropriate hand soil loading for a worker would be 0.44 mg/cm² (geometric mean peak value for farmers involved in hand weeding).

Exposure may therefore be estimated as:

Dermal exposure = Conc._{soil} x Dermal adherence_{soil} x Skin area contaminated x Transfer_{soil/skin}

and

Absorbed dose = Dermal exposure x Dermal absorption (%)

It is accepted that not all of the active substance in a layer of soil exposed to skin may be bioavailable. However, in the absence of specific information on the transfer of the active substance from soil to the skin conservative assumptions should be used.

Assuming a surface area of the hands of 820 cm², complete coverage of the hands (Transfer_{soil/skin} = 100%), and a soil retention value of 0.44 mg/cm², the daily maximum hand loading would be 361 mg of soil. This amount of soil containing the PEC of Chloropicrin, at a concentration of 16.7 mg/kg of soil, would contain 0.00603 mg Chloropicrin.

Assuming a dermal absorption value of 100% (in the absence of data) and a 60 kg body weight, the systemic exposure for a worker handling Chloropicrin treated soil would be 1 x 10⁻⁴ mg/kg bw/day. This estimated exposure is for workers handling treated soil with bare hands, i.e. no PPE.

On the basis of the estimated dermal exposures, the portion of the proposed AOEL_{systemic} (0.002 mg/kg bw/day) accounted for is shown in the following table. Systemic exposures were estimated assuming a worst-case 100% dermal absorption. This estimation is assuming that no personal protective equipment (PPE) is worn.

Total Systemic Exposure – 60 kg person (mg/kg bw/day)	% of AOEL (0.002 mg/kg bw/day)
1 x 10 ⁻⁴	5%

The exposure estimates shown above demonstrate that when working with treated soil worker exposures to Chloropicrin are negligible when compared to the AOEL_{systemic}. These results indicate that Chloropicrin can be used in a manner consistent with label recommendations without potential risks to workers re-entering a treated plot for manual transplanting of crops, without the use of PPE (gloves).

² Kissel, J., Richter, K. & Fenske, R., (1996). Field measurements of dermal soil loading attributable to various activities: implications for risk assessment. Risk Anal. Feb 16(1), 115-125

Assessment of inhalation exposure of workers involved in activities post application, i.e. VIF cutting and VIF removal.

The field generated data for exposures of operators and workers to Chloropicrin can be used to assess the potential risks to workers involved in activities post application, i.e. VIF cutting and VIF removal.

From the study results, the various activities associated with first the application and then the cutting and removal of the VIF present air concentrations to which the operators / workers were exposed. In this section the data are considered for the operators present during cutting and removal of the VIF and for these operations the worst case exposures were for Worker 1 (tractor driver) during VIF cutting and Worker 2 (VIF remover) during VIF removal. Exposures to workers present at the site who were assisting in activities to the side of the plot were lower. Where appropriate exposures estimates are refined with the use of RPE.

VIF Cutting

The average air concentration to which Worker 1 (tractor driver) was exposed was 0.303 mg/m³ Chloropicrin. Worker 1 was engaged in these activities for a total of only 77 minutes (1.28 hours) but it is necessary to estimate the exposure data to a realistic worst case working day for continued exposure to Chloropicrin for this activity (6 hours).

The average air concentration to which Worker 3 (assistant) was exposed was 0.019 mg/m³ Chloropicrin. Worker 3 was engaged in these activities for a total of only 77 minutes (1.28 hours) but it is necessary to estimate the exposure data to a realistic worst case working day for continued exposure to Chloropicrin for this activity (6 hours).

The breathing rate for a worker involved in light activity is considered appropriate for the assessment and this is taken to be 1.25 m³/hour. The calculated systemic doses are shown in the table below.

On the basis of the estimated exposures, the portion of the proposed AOEL_{systemic} (0.002 mg/kg bw/day) accounted for is shown in the following table. Systemic exposures were estimated assuming a worst-case 100% inhalation absorption. This estimation is assuming that no respiratory protective equipment (RPE) is worn.

Worker	Total Systemic Exposure – 60 kg person (mg/kg bw/day)	% of AOEL (0.002 mg/kg bw/day)
Worker 3 (tractor driver)	$2.2725 / 60 = 0.0379$	1895%
Worker 1 (assistant)	$0.1425 / 60 = 0.0024$	120%

The product label for Chloropicrin advises wearing of suitable respiratory protection for activities associated with VIF removal. The exposure assessment for the tractor driver can be refined further using the RPE APF values noted earlier.

Total Systemic Exposure 60 kg person (mg/kg bw/day)	RPE type	RPE reduction factor (APF)	% of AOEL (0.002 mg/kg bw/day)
$2.2725 / 60 = 0.0379$	Half mask with gas filter	10 (x 0.1)	189%
$2.2725 / 60 = 0.0379$	Full mask with gas filter	20 (x 0.05)	95%

2.2725 / 60 = 0.0379	Power assisted full face gas filtering device (TM 3)	40 (x 0.025)	47%
----------------------	--	--------------	-----

The exposure estimates shown above demonstrate that worker exposures to Chloropicrin during field activities associated with VIF cutting are significantly less than the AOEL_{systemic} only if a power assisted full face gas filtering device (TM 3) is worn.

VIF Removal

The average air concentration to which Worker 2 (VIF remover) was exposed was 0.00875 mg/m³ Chloropicrin. Worker 2 was engaged in these activities for a total of 147 minutes (2.45 hours) but it is necessary to estimate the exposure data to a realistic worst case working day for continued exposure to Chloropicrin for this activity (6 hours).

The average air concentration to which Worker 3 (assistant) was exposed was 0.00275 mg/m³ Chloropicrin. Worker 3 was engaged in these activities for a total of 147 minutes (2.45 hours) but it is necessary to estimate the exposure data to a realistic worst case working day for continued exposure to Chloropicrin for this activity (6 hours).

The breathing rate for a worker is taken to be 1.25 m³/hour. The calculated systemic doses are shown in the table below

On the basis of the estimated exposures, the portion of the proposed AOEL_{systemic} (0.002 mg/kg bw/day) accounted for is shown in the following table. Systemic exposures were estimated assuming a worst-case 100% inhalation absorption. This estimation is assuming that no respiratory protective equipment (RPE) is worn.

Worker	Total Systemic Exposure – 60 kg person (mg/kg bw/day)	% of AOEL (0.054 mg/kg bw/day)
Worker 2 (VIF remover)	0.0656 / 60 = 0.00109	54.5%
Worker 3 (assistant)	0.0206 / 60 = 0.00034	17%

The exposure estimates shown above demonstrate that worker exposures to Chloropicrin during field activities associated with VIF removal are significantly less than the AOEL_{systemic}.

2.7 Residues

2.7.1 Definition of the residues relevant to MRLs

The metabolism and quantitative characterization of [¹⁴C]Chloropicrin was studied in 3 crops following soil fumigation pre-planting at a rate of 33.637 ml/m². Samples of plant parts (fruit, root, stem, leaves) were collected 66 days post-planting and at harvest. Residue levels were determined at both these sampling times on four replicates for each crop. Chloropicrin was not detected at any time in any part of the plant. No other residues of toxicological concern were identified in plant parts at immature and mature growth stages of the crops and a similar metabolic pathway was utilised by all three diverse crops. Chloropicrin residues were identified after sodium bicarbonate extraction as glucose, fructose, and sucrose. The remaining unextractable residues were characterised by cell fractionation procedures and were found to be distributed among starch, protein, pectin, lignin, hemicellulose, and

cellulose. This indicates that the carbon in the Chloropicrin was generally distributed within the carbon pool of the plant.

2.7.2 Residues relevant to consumer safety

The only crop supported is tomatoes. No residues of Chloropicrin were detected in tomatoes. Calculation of the TMDI based on the proposed MRL of 0,01 mg/kg in all crops presented in Table 1 Section 1.4.3.1 (summary of intended use Volume 1, Level 1) has shown that a maximum of 3,1 % of the ADI would be consumed. Considering the ARfD value: IESTI 1 = 58.1%, IESTI 2 = 42.1 % respectively for all consumer categories, there is no evidence of risk for the consumers.

2.7.3 Residues relevant to worker safety

The proposed uses of Chloropicrin 99 do not present an unacceptable risk to the health of workers during application at the recommended use rate and GAP. Chloropicrin 99 is applied pre-planting, and is not present at the time of sowing crops 22 ± 2 days later. It is therefore not relevant to determine a particular re-entry time for workers and the risk to worker safety can be regarded as low.

2.7.4 Proposed MRL and compliance with existing EU MRLs

On the basis of the residue data generated in Italy and the UK and reported (please refer to Volume 3, B7, B7.12), it is evident that residues in tomatoes will not exceed the Limit of Quantification (LOQ) of 0.005 mg/kg.

On the basis of new residue data presented, 4 trials in Northern Europe and the 4 trials in Southern Europe, one MRL of 0,01 mg/kg of has been calculated according to Method 1 and Method 2 (EU guideline Document 7039/V/95 EN 7, 22 Jul 1997). The MRL proposed is therefore 0.01 mg/kg.

2.7.5 Proposed import tolerances and compliance with existing EU import tolerances

Any raw or processed products imported from countries outside the EU are unlikely to contain residues of Chloropicrin above the proposed MRL of 0,01 mg/kg. Chloropicrin is considered to be exempt from tolerances in the US and other regions. Therefore, it is proposed that EU import tolerances be set at 0,01 mg/kg. No EU import tolerances have yet been established.

2.8 Fate and behaviour in the environment

2.8.1 Definition of the residues relevant to the environment

Chloropicrin may be relevant for the atmosphere. This compound and its major metabolite Dichloromethane may be relevant for surface water, groundwater and soil.

Please refer to the DAR from 2006.

An adsorption/desorption study was carried out according to OECD guidelines. The adsorption and desorption behaviour of Chloropicrin was determined in five soils. Freundlich adsorption coefficients ($K_{ads, Foc}$) were calculated in four of the soils and were in the range 0.414 - 1.15. Adsorption coefficients corrected for organic carbon content (K_{Foc}) were in the range 24.9 - 122 (mean value of 60.5 l/kg), indicating low affinity of Chloropicrin for soil.

Using the McCall scale to assess potential mobility (based on $K_{ads, Foc}$), Chloropicrin is classified as having a 'very high' to 'high' potential for mobility in soil.

An aged column leaching study was carried out to OECD guidelines. The average K_d values for Chloropicrin and Dichloronitromethane based on the leachate volumes necessary for 50% elution from the columns were calculated to be 0.381 and 0.363, respectively. The average K_{oc} for Dichloronitromethane was calculated to 30.14 l/kg.

The major breakdown product of Chloropicrin was found to be Dichloronitromethane with a formation fraction of 20.4% of the recovered radiocarbon in column A and 21.3% in column B. The formation of Dichloronitromethane supports the previously proposed breakdown pathway.

PECs in soil were calculated according to the Draft Working Document (EU DG Agriculture, VI B II.1, Document No. 7193/VI/99 rev.0 of 09.08.1999) and the FOCUS Document on Soil Persistence Models (FOCUS 1996). Soil PECs are not calculated specific for certain crops or regions in the EU, but are depending only on application rate and plant interception, and, for off-crop soils, on drift rate which is not of concern for Chloropicrin because of the application by injection and tarping. Dichloronitromethane concentrations in soil have been calculated.

2.8.2 Fate and behaviour in water

2.8.2.1 Groundwater

PECs groundwater has been recalculated by RMS according to FOCUS groundwater scenarios as described in SANCO Document 321/2000 rev. 2 (FOCUS 2000).

The five realistic groundwater scenarios for tomatoes were modeled.

The PEC_{gw} calculations are based on an initial application of 448 kg a.s./ha and a period under tarp of 8 days after application ($DT_{50, aerob}$ 9.4 days).

PEC_{gw} for Chloropicrin and dichloronitromethane (DCNM) were recalculated by RMS using the FOCUS PEARL and PELMO models. Using PEARL the average annual concentration (80th percentile) value was 206.5 ug/L for Chloropicrin and 135.8 ug/L for DCNM. Using PELMO the average annual concentration values (80th percentile) were 49.1 ug/L for Chloropicrin and 302.2 ug/L for DCNM.

2.8.2.2 Surface water

Surface water

PECs surfacewater and sediment have been recalculated by RMS according to FOCUS Surface Water Scenarios Working Group (FOCUS 2001; final 2003), to determine entry into three types of surface water bodies (pond, ditch, stream). Contamination of surface water is most likely through drainage. Due to the proposed method of application (soil injection) neither spray drift nor run-off contribute to the PECs. The highest PEC_{sw} estimates from the four scenarios for tomatoes are likely to represent at least a 90th percentile worst-case for surface water exposure in the EU.

The maximum surface water PEC was found to be 6.573 ug/L for Chloropicrin and 4.350 ug/L for DCNM. The maximum sediment PEC was found to be 1.410 ug/kg for Chloropicrin and 0.779 ug/kg for DCNM.

2.8.3 Fate and behaviour in air

When Chloropicrin is applied to the soil and covered with a virtually impermeable film, it is unlikely to be released in significant amounts into the atmosphere. While covered by tarp Chloropicrin is degraded and so, once the tarp is removed, volatilization to the atmosphere is lower. This has been confirmed by the results of a soil emission study (Trevisan, 2009) which charted concentrations following applications of Chloropicrin during and after the tarping period. The Daily Weight Mean (DWM) values were maximum 0.0491 mg/m³ on the day of application reaching a DWM maximum of 0.1702 mg/m³ on the day 4.

2.9 Effects on non-target species

Since the active substance is equivalent to the product (Chloropicrin 99), effects on non-target organisms, evaluated on the active substance only, and relative risk assessment apply to both.

2.9.1 Effects on terrestrial vertebrates

In the original DAR 2005 the RMS pointed that for mammals the dietary route of exposure could not be negligible. Since the treated field remains covered by tarp till 8 day after application of Chloropicrin, terrestrial vertebrates will not gain access to the treated area during this lapse of time. Therefore birds and mammals will not be exposed to in-field food items contaminated at initial concentration, but concern remains for off-field and in-field (after tarp removal) exposure of vertebrates to contaminated food that might still contain significant residues. In response to requests made in the DAR 2005 and the comments from EFSA and several MS, studies into the acute oral, dietary, long-term and inhalation toxicity to birds have been carried out. In addition, a study on residues on food items has also been performed.

Birds

The acute oral LD₅₀ value for northern bobwhite exposed to encapsulated Chloropicrin as a single oral dose was calculated to be 62 mg/kg with a 95 % confidence interval of 43 mg/kg to 84 mg/kg.

Dietary toxicity studies were carried out in the Bobwhite Quail and the Mallard Duck fed with encapsulated Chloropicrin mixed with the basal ration. In the Mallard study there were

no overt signs of toxicity in the 17.8, 31.6, 56.2, 100, 178 and 316 ppm a.s. treatment groups and all birds at these concentrations were normal in appearance and behaviour throughout the test. At the 562 ppm a.s. test concentration, reduction on body weight and signs of toxicity including lethargy and loss of coordination were noted, but within the post-exposure period all effects recovered. The LC_{50} for mallard duck was determined to be greater than the highest dosage tested, i.e. $LC_{50} > 562$ ppm (243 mg a.s./kg bw/day). Based on a reduction in body weight gain and signs of toxicity in the 562 ppm treatment group, the NOEC was 316 ppm (140 mg a.s./kg bw/day). The dietary LC_{50} value for Chloropicrin on the Northern Bobwhite was determined to be 476 ppm a.s., with a 95 % confidence interval of 374 to 671 ppm a.s. This corresponds to a daily dose of 108 mg/kg bw/day. Based on the toxicity and mortality at the 316 ppm a.s. treatment level, the 'No-observed effect concentration' was 178 ppm a.s (43 mg a.i./Kg/d).

A study was performed to assess the inhalation toxicity of Chloropicrin administered via whole-body inhalation to the northern bobwhite (*Colinus virginianus*). Birds were treated for 4 hours/d for five consecutive days. The no-observed-effects level (NOEL) and the no-observed-adverse-effects level (NOAEL) for inhalation exposure of northern bobwhite quail to Chloropicrin was 96 ppb, based on clinical observations of gasping in males in the 659 ppb group and microscopic changes in the respiratory tract of the 305 and 659 ppb group of males and females. No mortality occurred at any dose level, therefore the LC_{50} is greater than 659 ppb.

Long term toxicity data for birds (northern bobwhite) are also available from a reproduction test carried out according to the "OECD Proposal for a New Test Guideline. Avian Reproductive Toxicity Test in the Japanese Quail or Northern Bobwhite. The birds were fed a nominal dose of 10, 50, or 100 ppm a.s. of encapsulated Chloropicrin in the diet for a period of six weeks. There were no treatment-related mortalities, overt signs of toxicity or treatment-related effects upon body weight or feed consumption at any of the concentrations tested. Additionally, there were no treatment-related effects upon any of the reproductive parameters measured at 10, 50 or 100 ppm a.s. test concentrations. Based on the results of this study, the no-observed-effect concentration for Northern bobwhite exposed to Chloropicrin in the diet was 100 ppm a.s., the highest concentration tested. The results of the range-finder test at the high dose concentration support the methodology and validity of the 100 ppm a.s. end-point. This corresponds to a daily dose NOEL of 24.2 mg/kg bw/d.

Conclusion. The acute, short term and long-term risk assessment for medium herbivorous and small vermivorous birds is acceptable. Anyhow, since Chloropicrin is applied to bare soil, a small granivorous bird (finch) is considered more appropriate than a pigeon (feeding on seeds) as representative of granivorous birds. A risk assessment for this bird should be used for the purpose of the present risk assessment.

For insectivorous birds, some of the refinements proposed are not sufficiently supported/documented and therefore it is concluded that an acceptable risk has not been demonstrated.

Mammals

Within the dossier submitted for the present resubmission, the Notifier included a study on residues on several food items (Bartolomè, 2009, see Other/Special Studies, IIA 8.16.1) and presented a Tier 2 risk assessment for mammals.

The risk assessment was based on brown hare (*Lepus europaeus*), chosen as focal species representative of medium sized herbivorous mammals (3.5 Kg). For the sake of clarity and to keep the present Addendum as concise as possible, the original risk assessment submitted by the Notifier is included in Annex I. Briefly, the concentration of the test substance in diet has been refined based on the same data of measured residues and calculated DT50 used in the risk assessment for birds (Bartolomè, 2009). Further refinements were also made for PD, PT

and ftwa. The Notifier concludes that the risk posed by Chloropicrin to herbivorous mammals foraging in treated field of tomatoes is acceptable. The RMS objects on the choice of the hare as “focal” species. Since Chloropicrin is applied to bare soil, a small omnivorous mammal is thought to be a more representative species than hare, that is a strictly herbivorous species. In case of pesticides applied to bare soil, the recently adopted revision of the Guidance Document SANCO/4145/2000 (EFSA 2008) recommends to consider as generic focal species a small omnivorous mammal (mouse).

Conclusion - the presented risk assessment is not judged acceptable and the point is considered still open. The risk assessment should be based on a small omnivorous mammal (mouse).

2.9.2 Effects on aquatic species

The acute toxicity of Chloropicrin has been established in studies on Rainbow trout (*Oncorhynchus mykiss*), Bluegill Sunfish (*Lepomis macrochirus*), *Daphnia magna* and green alga (*Selenastrum capricornutum*), which have been summarized in the original DAR 2005. An additional test was conducted to assess the inhibitory effect of chloropicrin on the growth of the freshwater diatom *Navicula pelliculosa* after 120h exposure, but the results have been considered not acceptable (see section B9).

Table 2.9.2-1: Summary of aquatic acute toxicity data

Test species	Test system	Duration of exposure	Results
<i>Oncorhynchus mykiss</i>	Acute	96 h	LC ₅₀ 4.8 µg/l.
<i>Lepomis macrochirus</i>	Acute	96 h	LC ₅₀ 48 µg/l.
<i>Daphnia magna</i>	Acute	48 h	EC ₅₀ 0.15 mg/l.
(Straus)			
<i>Selenastrum capricornutum</i>	Acute	72 hours	E _b C ₅₀ (72 hours) 0.11 µg/l E _r C ₅₀ (0 – 72 hours) 0.16µg/l
<i>Navicula pelliculosa</i>	Acute	120 hours	not accepted
<i>Oncorhynchus mykiss</i>	Long term	90 days	NOEC 2.5 µg/l
<i>Daphnia magna</i>	Long term	21 days	NOEC 4.27 µg/l
(Straus)			
<i>Lemna minor</i>	Acute	7 days	E _b C ₅₀ 14.0 µg/l E _r C ₅₀ 37.9 µg/l E _y C ₅₀ 6.80µg/l (dw)

The assessment of acute risk has been carried out using the relevant PEC values for surface water derive from FOCUS FOCUS Step 3 for the worst of 4 relevant scenarios (D6, ditch).

The resulting TER values are shown in Table 2.9.2-2 and Table 2.9.2-3.

Table 2.9.2-2: Summary of aquatic acute TER data

Method of Application	Test System	Test species	Effect Concentration (µg as/l)	PEC _{sw} # (µg as/l)	TER	Trigger
Soil Injection	Acute	Fish <i>Oncorhynchus mykiss</i>)	4.8	6.573	0.7	< 100
	Acute	Invertebrate	150	6.573	22.8	< 100
	72 hours	Algae 1	0.11	6.573	0.017	< 10
	7 days	Aquatic plants	6.80	6.573	1.0	< 10

Table 2.9.2-3: Summary of aquatic chronic TER data

Method of Application	Test System	Test species	Effect Concentration (µg as/l)	PEC _{sw} # (µg as/l)	TER	Trigger
Soil Injection						
	Flow-through (F-ELS test)	Fish <i>Oncorhynchus mykiss</i>)	NOEC: 2.5	6.573 (PECi) 0.403 (50d PEC _{twa})	0.4 6	< 10
	semistatic (reproduction test)	Invertebrate (<i>D. magna</i>)	NOEC: 4.27*	6.573 (PECi) 0.859 (21d PEC _{twa})	0.6 5	< 10

The TER values for the acute and chronic toxicity calculated based on PEC_{initial} and PEC_{twa} are below the relevant triggers. Consequently the acute and chronic risk from the proposed use to aquatic species is considered to be unacceptable for the D6 scenario. For the other 3 scenarios (R2,R3,R4) the PEC values are calculated equal to 0 µg as/l, therefore since exposure is unlikely no chronic risk is expected.

The same conclusion apply to the metabolite dichloronitromethane, DCNM. Even if the metabolite is assumed to be as toxic to aquatic organisms as chloropicrin, the resulting TER estimates would still be below the triggers for the D6 scenario. For the other 3 scenarios (R2,R3,R4) the PEC values are calculated equal to 0 µg as/l, therefore since exposure is unlikely no acute or chronic risk is expected.

A bioconcentration study in fish was not performed with Chloropicrin as the partition coefficient, log Pow, is 2.5. As the Pow < 3, it is unlikely that it will partition into fatty tissues.

As Chloropicrin is unlikely to partition and persist in sediments and to bioaccumulate, the risk for sediment dwelling organisms is considered acceptable.

2.9.3 Effects on bees and other arthropod species

Even though exposure to bees flying on the treated field is unlikely, they might be exposed while foraging in the surrounding areas or in hives present at the field hedge.

In order to determine the risk of off-site inhalation of Chloropicrin to bees a 1 hour inhalation toxicity study was carried out.

In the study young adult worker honey bees were exposed to five concentrations of the test substance in air for one hour and observed for the following 48 hours.. No significant treatment related mortality occurred during the test. A 1 hour inhalation 48h LC₅₀ > 12,200 ppb (82.2 mg/m³) and a NOEC = 12,200 ppb (82.2 mg/m³) were determined.

TER values derived from maximum exposure rates determined in a field emission study (Annex IIIA, 7.3.3/01, Ferrari, 2009) are presented below. The maximum single measured air concentration was used for the risk assessment to bees, as worst case exposure.

No risk via inhalation is expected.

Table 2.9.3-1: TER values for bee inhalation

Test species	Exposure Levels	End Point	TER	Trigger
Honeybee (<i>Apis mellifera</i>)	1 meter from site 45.9 ppb 0.3077 mg/m ³	LC ₅₀ > 12,200 ppb 82.2 mg/m ³ (1 hour exposure)	> 266	10

Chloropicrin was tested at a broad range of concentrations in four representative terrestrial arthropod species, Rove Beetle (*Aleochara bilineata*), Carabid Beetle (*Poecilus cupreus*), Wolf Spider (*Pardosa spp*) and Springtail (*Folsomia candida*), and was shown to have significant effects on survival and reproduction in laboratory studies. Based on the results of these tests, higher tier testing was carried out using a dose equivalent to a field rate 272 L/ha (Table 2.9.3-2).

The off-field risk is considered to be low, due to the method of tarp application that prevents lateral movement of Chloropicrin in soil outside the tarp edge during the first 8d after application. Based on concentrations in air measured in a field study (see IIA 7.3.3/01) and on toxicity data from a bee inhalation study (IIA 8.7/01), it is concluded that risk to arthropods by inhalation is low.

Table 2.9.3-2: Effects on non-target terrestrial arthropods in extended laboratory tests

Test species	Test system	Duration of exposure	Results	References
Rove Beetle <i>Aleochara bilineata</i>	Extended laboratory	28 days	Chloropicrin applied at a field rate (272 L/ha) had no effect on the reproductive capacity of adult female rove beetles <i>Aleochara bilineata</i> four days after application.	Gray, J. (2004)
Carabid Beetle <i>Poecilus cupreus</i>	Extended laboratory	28 days	Chloropicrin applied at a field rate (272 L/ha) had no effect on survival, behaviour and predation rate.	Gray, J. (2004)
Wolf Spiders <i>Pardosa spp</i>	Extended laboratory	14 days	Chloropicrin applied at a field rate of 272 L/ha, had no effect on survival or prey consumption.	Sharples, A. (2004)
Springtails <i>Folsomia candida</i>	Extended laboratory	14 days	No <i>Candida</i> survived at a rate of 272 L/ha immediately post-tarp removal (4 DAT). However, there was no effect on survival or reproduction following exposure to residues aged for 14 days after removal of the tarp.	Wainwright, M. (2004)

Chloropicrin applied at field rate of 272 L/ha, had severe effect after initial exposure (4 days after treatment), but no effect on survival, prey consumption or reproduction were observed on the four non-target arthropods species tested upon exposure to 14 days aged residues (18d after treatment). Overall, in-field data indicate that the risk to ground dwelling arthropods could be acceptable based on the potential for recolonisation within an acceptable period.

2.9.4 Effects on earthworms and other soil macro-organisms

From the acute test conducted applying Chloropicrin as soil Injection (20 cm depth), the LC₅₀ value was calculated to be 75.5 ppm, from which a corrected LC₅₀ = 37.75 mg as/kg dw soil was derived. The calculated TER value is below the relevant Annex VI trigger value of 10 for application of Chloropicrin, indicating unacceptable acute risk to worms.

To study the long-term effects of Chloropicrin application an earthworm reproduction study using aged field soil was carried out. Information on method of treatment, tarping and its duration is lacking and should be provided. Pending on confirmation on the relevance of the treatment to the proposed GAP, the results of the study are acceptable only for the 28d survival and growth results, which indicate lack of effect at aged residue up to 0.275 mg/kg. The results of the in-house reproduction test are considered inconclusive. And NOEC cannot be derived.

The finding of worms in areas adjacent the treated area one month after treatment indicate the presence of a source of living worms with a potential to recolonize the treated area, but the

study does not provide conclusive data on the time necessary for a successful reproduction and full recovery of the population.

The results of the field monitoring suffer from the same limitation due to the low number of juveniles found in the control field sample. The in-field worm population was not monitored after treatment. The concentrations of the test compound at various distances from the treated area are not reported and therefore the lack of a trend associated with distance cannot be discussed in terms of concentration.

In conclusion, the study provides evidence about the survival of worms 1 month after treatment both in-field and off-field, but not evidence about adequate reproduction.

Risk assessment

In the study on aged residues (Rogers, M. H., 2009b, see above), Chloropicrin concentration measured 2 month after treatment (0.275 mg/Kg) was about 100 times lower than the NOEC mortality of the acute test (14d NOEC=21 mg/Kg). The results of this study confirms the lack of effects on survival and growth expected at these concentrations but from this study a NOEC for reproduction could not be retrieved.

Conclusion

The RMS considers the point still open and proposes to wait for the results of the ongoing reproduction test for a final risk assessment.

2.9.5 Effects on soil micro-organisms

The effects of Chloropicrin on nitrogen and carbon transformation by soil microorganisms, and on soil microbial biomass were assessed over a 98 day under conditions anticipated in the field (Chloropicrin applied at 1 x MAR, equivalent to 272 litres/hectare). Chloropicrin had no long-term influence on carbon transformation in soils and no long-term influence on the microbial populations examined in this study (*Pseudomonas*, *Actinomycetes* and fungal populations). Nevertheless, a long-term influence on nitrogen transformation activities in soil was observed in this study.

To evaluate the impact of Chloropicrin on soil non-target micro-organisms and demonstrate recovery of the soil functions (nitrogen transformation and carbon transformation activity), two additional studies were submitted (one laboratory and one field study), which are summarized below..

In the laboratory study (Point IIA 8.10.1./02), treatment of soil with Chloropicrin (1 x MAR – 272 litres/ha and 5 x MAR – 1360 litres/ha) and covering with VIF for 7 days resulted in long term influence of nitrogen transformation activities in soil up to Day 142 (end of the study). Deviations in nitrogen transformation activity compared to non-treated control soil were greater than 25%, indicating unacceptable effects. A long-term reduction of population of *Pseudomonas* bacteria and *Actinomycetes* was also recorded. Although the study is not fully reliable, it provides evidence of long term effects of under laboratory conditions.

In the field study (Point IIA 8.10.1/03), the application of chloropicrin at field rates of 272 and 400l/ha (with 8d tarping) resulted in consistent transient effects on soil microflora in terms of both carbon and nitrogen transformation rate. Relevant effects in the 28d laboratory test were observed in samples collected until day 16 following treatment. In the soil sampled at the end of the study (29 days following treatment), deviations in overall formation rates between the non-treated control and chloropicrin treated groups were below the regulatory trigger of $\pm 25\%$ at the end of the 28d laboratory study, indicating no long term effects on soil microbial populations and soil functions. By the end of the study period, microbial populations showed a full recovery in viable numbers.

From the field study, it can be concluded that field applications of Chloropicrin are expected to have no long term influence on soil micro-flora under field conditions. Transient effects are observed, which recovered within one month. Hence, an acceptable risk is posed to soil microorganism.

2.9.6 Effects on other non-target organisms (flora and fauna)

A study was carried out to evaluate potential adverse effects of Chloropicrin on seed germination and vegetative vigor to six plant species (corn, soybean, ryegrass, oilseed rape, cucumber and sunflower) when administered as a vapor for 2 consecutive daily 6-hour exposure periods. Effects were established by identifying endpoints based on analyzed air concentrations. During the course of the study vegetative vigor was identified as being the most sensitive endpoint while seedling emergence was largely unaffected. The no-observed-effect concentration (NOEC) for Chloropicrin vapor exposure for 2 consecutive days was 1 ppm and the EC₅₀ for the most sensitive species was determined to be 5.2 ppm. , taking into account the effects noted on all six species The risk assessment, as worst case, has been carried out taking into account the NOEC= 1000ppb level from the above study and the maximum exposure level (at 1 m distance) derived from the field emission study (Trevisan 2009, IIIA 7.3.3/01).

Toxicity Exposure Ratio for Vapor Exposure of Chloropicrin to Plants

Test species	Exposure Levels	Duration of exposure	End Point	TER	Trigger
Monocots (Ryegrass, Corn)	45.9 ppb	4 periods of 6 hours exposure.	NOEC 1ppm (1000 ppb)	21.8	5
Dicots (Rape, Sunflower, Cucumber, Soy)	0.3077 mg/m ³		6.7 mg/m ³		

The calculated TER values indicate that there are no adverse effects expected due to Chloropicrin exposure to non target plants in areas adjacent to treated fields.

2.9.7 Effects on biological methods of sewage treatment

In response to a request from the RMS and EFSA, the effects of Chloropicrin on the respiration rate of activated sludge were assessed according to the method outlined in the OECD Test Guideline 209, 'Activated Sludge, Respiration Inhibition Test'.

Concentration-related inhibition of respiration rates was observed at all the tested concentrations, (7,8-287 mg/L) with the highest concentration (287) showing 96 to 100% inhibition. The thirty minute EC₅₀ of the test substance was calculated to be 6.4 mg/L (95% confidence limits, 5.3 – 7.4 mg/L). The thirty minute EC₂₀ and EC₈₀ values were calculated to be 1.9 and 21.6 mg/L (95% confidence limits, 1.3 – 2.6 and 18.7 – 25.2 mg/L) respectively.

As Chloropicrin is applied directly to soil by direct injection direct contamination of the STP would not be possible. Furthermore the maximum PEC in surface water was determined to be

6.6 ug/l, which is three order of magnitude less than the EC50 for STP. Therefore a conclusion of low risk can be drawn.

2.9.8 Metabolites

The major metabolite of Chloropicrin is Dichloronitromethane. Dichloronitromethane appears to be formed as a breakdown product of Chloropicrin in several metabolic systems. Formation of Dichloronitromethane has been shown to be conserved in animal, soil and aquatic systems. Thus, Chloropicrin ecotoxicology studies in animals and ecotoxicology trials in soil systems will also have inherently investigated the ecotoxicological effects of its main metabolite, Dichloronitromethane, in concentrations much higher than those that would be found in the field. Dichloronitromethane has been shown to be only transiently formed in these systems and, as Chloropicrin is not applied repeatedly, will not pose a chronic or long term risk to organisms. Considering the transient nature of Dichloronitromethane, its simplicity and similarity to its parent compound, its toxicological nature and the fact that it occurs as a 20% dechlorination breakdown product of Chloropicrin, it would be highly unlikely that this metabolite could be of any more concern than its parent compound.

Therefore it is concluded that sufficient evidence is available to demonstrate the low concern of Dichloronitromethane when compared to Chloropicrin. As such testing is not deemed necessary to prove its environmental safety.

APPENDIX 1**STANDARD TERMS AND ABBREVIATION**

A	ampere
Ach	acetylcholine
AchE	acetylcholinesterase
ADI	acceptable daily intake
ADP	adenosine diphosphate
AE	acid equivalent
AFID	alkali flame-ionization detector or detection
A/G	albumin/globulin ratio
ai	active ingredient
ALD ₅₀	approximate median lethal dose, 50%
ALT	alanine aminotransferase (SGPT)
AOEL	acceptable operator exposure level
AMD	automatic multiple development
ANOVA	analysis of variance
AP	alkaline phosphatase
approx	approximate
ARC	anticipated residue contribution
ArfD	acute reference dose
as	active substance
AST	aspartate aminotransferase (SGOT)
ASV	air saturation value
ATP	adenosine triphosphate
BCF	bioconcentration factor
bfa	body fluid assay
BOD	biological oxygen demand
bp	boiling point
BSAF	biota-sediment accumulation factor
BSE	bovine spongiform encephalopathy
BSP	bromosulphophthalein
Bt	bacillus thuringiensis
Bti	bacillus thuringiensis israelensis
Btk	bacillus thuringiensis kurstaki
Btt	bacillus thuringiensis tenebrionis
BUN	blood urea nitrogen
bw	body weight
c	centi- (x 10 ⁻²)
°C	degree Celsius (centigrade)
CA	controlled atmosphere
CAD	computer aided design
CADDY	computer aided dossier and data supply (an electronic dossier interchange and
archiving	format)
cd	candela
CDA	controlled drop(let) application
cDNA	complementary DNA
CEC	cation exchange capacity
cf	confer, compare to
CFU	colony forming units
ChE	cholinesterase
CI	confidence interval
CL	confidence limits
cm	centimetre
CNS	central nervous system
COD	chemical oxygen demand

CPK	creatinine phosphatase
cv	coefficient of variation
Cv	ceiling value
CXL	Codex Maximum Residue Limit (Codex MRL)
d	day
DES	diethylstilboestrol
DFR	dislodgeable foliar residue
DMSO	dimethylsulfoxide
DNA	deoxyribonucleic Acid
dna	designated national authority
DO	dissolved oxygen
DOC	dissolved organic carbon
dpi	days pot inoculation
DRES	dietary risk evaluation system
DT ₅₀	period required for 50 percent dissipation (define method of estimation)
DT ₉₀	period required for 90 percent dissipation (define method of estimation)
dw	dry weight
DWQG	drinking water quality guidelines
&	decadic molar extinction coefficient
EC ₅₀	median effective concentration
ECD	electron capture detector
ECU	European currency unit
ED ₅₀	median effective dose
EDI	estimated daily intake
ELISA	enzyme linked immunosorbent assay
e-mail	electronic mail
EMDI	estimated maximum daily intake
EPMA	electron probe micro analysis
ERC	environmentally relevant concentration
ERL	extraneous residue limit
F	field
F ₀	parental generation
F ₁	filial generation, first
F ₂	filial generation, second
FIA	fluorescence immuno assay
FID	flame ionization detector
FOB	functional observation battery
fp	freezing point
FPD	flame photometric detector
FPLC	fast protein liquid chromatography
g	gram
G	glasshouse
GAP	good agricultural practice
GC	gas chromatography
GC-EC	gas chromatography with electron capture detector
GC-FID	gas chromatography with flame ionization detector
GC-MS	gas chromatography-mass spectrometry
GC-MSD	gas chromatography with mass-selective detection
GEP	good experimental practice
GFP	good field practice
GGT	gamma glutamyl transferase
GI	gastro-intestinal
GIT	gastro-intestinal tract
GL	guideline level
GLC	gas liquid chromatography
GLP	good laboratory practice
GM	geometric mean
GMO	genetically modified organism
GMM	genetically modified micro-organism

GPC	gel-permeation chromatography
GPPP	good plant protection practice
GPS	global positioning system
GSH	glutathion
GV	granulosevirus
h	hour(s)
H	Henry's Law constant (calculated as a unitless value) (see also K)
ha	hectare
Hb	haemoglobin
HCG	human chorionic gonadotropin
Hct	haematocrit
HDT	highest dose tested
hL	hectolitre
HEED	high energy electron diffraction
HID	helium ionization detector
HPAEC	high performance anion exchange chromatography
HPLC	high pressure liquid chromatography or high performance liquid chromatography
HPLC-MS	high pressure liquid chromatography - mass spectrometry
HPPLC	high pressure planar liquid chromatography
HPTLC	high performance thin layer chromatography
HRGC	high resolution gas chromatography
Hs	Shannon-Weaver index
Ht	haematocrit
I	indoor
I ₅₀	inhibitory dose, 50%
IC ₅₀	median immobilization concentration or median inhibitory concentration ¹³
ICM	integrated crop management
ID	ionization detector
IEDI	international estimated daily intake
IGR	insect growth regulator
im	intramuscular
inh	inhalation
ip	intraperitoneal
IPM	integrated pest management
IR	infrared
ISBN	international standard book number
ISSN	international standard serial number
iv	intravenous
IVF	<i>in vitro</i> fertilization
k	kilo
K	Kelvin or Henry's Law constant (in atmospheres per cubic meter per mole) (see also H)
K _{ads}	adsorption constant
K _{des}	apparent desorption coefficient
K _{oc}	organic carbon adsorption coefficient
K _{om}	organic matter adsorption coefficient
kg	kilogram
L	litre
LAN	local area network
LASER	light amplification by stimulated emission of radiation
LBC	loosely bound capacity
LC	liquid chromatography
LC-MS	liquid chromatography- mass spectrometry
LC ₅₀	lethal concentration, median
LCA	life cycle analysis
LCLo	lethal concentration low
LC-MS-MS	liquid chromatography with tandem mass spectrometry
LD ₅₀	lethal dose, median; dosis letalis media
LDLo	lethal dose low

LDH	lactate dehydrogenase
LOAEC	lowest observable adverse effect concentration
LOAEL	lowest observable adverse effect level
LOD	limit of detection
LOEC	lowest observable effect concentration
LOEL	lowest observable effect level
LOQ	limit of quantification (determination)
LPLC	low pressure liquid chromatography
LSC	liquid scintillation counting or counter
LSD	least squared denominator multiple range test
LSS	liquid scintillation spectrometry
LT	lethal threshold
m	metre
M	molar
µm	micrometer (micron)
MC	moisture content
MCH	mean corpuscular haemoglobin
MCHC	mean corpuscular haemoglobin concentration
MCV	mean corpuscular volume
MDL	method detection limit
MFO	mixed function oxidase
µg	microgram
mg	milligram
MHC	moisture holding capacity
min	minute(s)
mL	millilitre
MLT	median lethal time
MLD	minimum lethal dose
mm	millimetre
mo	month(s)
mol	Mole(s)
MOS	margin of safety
mp	melting point
MRE	maximum residue expected
MRL	maximum residue level or limit
mRNA	messenger ribonucleic acid
MS	mass spectrometry
MSDS	material safety data sheet
MTD	maximum tolerated dose
n	normal (defining isomeric configuration) or number of observations 13
NAEL	no adverse effect level
nd	not detected
NEDI	national estimated daily intake
NEL	no effect level
NERL	no effect residue level
ng	nanogram
nm	nanometer
NMR	nuclear magnetic resonance
no	number
NOAEC	no observed adverse effect concentration
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NOED	no observed effect dose
NOEL	no observed effect level
NOIS	notice of intent to suspend
NPD	nitrogen-phosphorus detector or detection
NPV	nuclear polyhedrosis virus
NR	not reported
NTE	neurotoxic target esterase

OC	organic carbon content
OCR	optical character recognition
ODP	ozone-depleting potential
ODS	ozone-depleting substances
OM	organic matter content
op	organophosphorous pesticide
Pa	pascal
PAD	pulsed amperometric detection
2-PAM	2-pralidoxime
pc	paper chromatography
PC	personal computer
PCV	haematocrit (packed corpuscular volume)
PEC	predicted environmental concentration
PECA	predicted environmental concentration in air
PECs	predicted environmental concentration in soil
PEC _{SW}	predicted environmental concentration in surface water
PEC _{GW}	predicted environmental concentration in ground water
PED	plasma-emissions-detector
pH	pH-value
PHED	pesticide handler's exposure data
PHI	pre-harvest interval
PIC	prior informed consent
pic	phage inhibitory capacity
PIXE	proton induced X-ray emission
pKa	negative logarithm (to the base 10) of the dissociation constant)
PNEC	predicted no effect concentration
po	by mouth
Pow	partition coefficient between n-octanol and water
POP	persistent organic pollutants
ppb	parts per billion (10 ⁻⁹)
PPE	personal protective equipment
ppm	parts per million (10 ⁻⁶)
ppp	plant protection product
ppq	parts per quadrillion (10 ⁻²⁴)
ppt	parts per trillion (10 ⁻¹²)
PSP	phenolsulfophthalein
PrT	prothrombin time
PRL	practical residue limit
PT	prothrombin time
PTDI	provisional tolerable daily intake
PTT	partial thromboplastin time
QSAR	quantitative structure-activity relationship
r	correlation coefficient
r ²	coefficient of determination
RBC	red blood cell
REI	restricted entry interval
Rf	retardation factor
RfD	reference dose
RH	relative humidity
RL ₅₀	median residual lifetime
RNA	ribonucleic acid
RP	reversed phase
rpm	rotations per minute
rRNA	ribosomal ribonucleic acid
RRT	relative retention time
RSD	relative standard deviation
s	second
SAC	strong adsorption capacity
SAP	serum alkaline phosphatase

SAR	structure/activity relationship
SBLC	shallow bed liquid chromatography
sc	subcutaneous
sce	sister chromatid exchange
SD	standard deviation
se	standard error
SEM	standard error of the mean
SEP	standard evaluation procedure
SF	safety factor
SFC	supercritical fluid chromatography
SFE	supercritical fluid extraction
SIMS	secondary ion mass spectroscopy
SOP	standard operating procedures
sp	species (only after a generic name)
SPE	solid phase extraction
SPF	specific pathogen free
spp	subspecies
sq	square
SSD	sulphur specific detector
SSMS	spark source mass spectrometry
STEL	short term exposure limit
STMR	supervised trials median residue
t	tonne (metric ton)
$t_{1/2}$	half-life (define method of estimation)
T ₃	tri-iodothyroxine
T ₄	thyroxine
TADI	temporary acceptable daily intake
TBC	tightly bound capacity
TCD	thermal conductivity detector
TC _{Lo}	toxic concentration, low
TID	thermionic detector, alkali flame detector
TD _{Lo}	toxic dose low
TDR	time domain reflectrometry
TER	toxicity exposure ration
TER _i	toxicity exposure ration for initial exposure
TER _{ST}	toxicity exposure ration following repeated exposure
TER _{LT}	toxicity exposure ration following chronic exposure
tert	tertiary (in a chemical name)
TEP	typical end-use product
TGGE	temperature gradient gel electrophoresis
TIFF	tag image file format
TLC	thin layer chromatography
T _{lm}	median tolerance limit
TLV	threshold limit value
TMDI	theoretical maximum daily intake
TMRC	theoretical maximum residue contribution
TMRL	temporary maximum residue limit
TOC	total organic carbon
Tremcard	Transport emergency card
tRNA	transfer ribonucleic acid
TSH	thyroid stimulating hormone (thyrotropin)
TWA	time weighted average
UDS	unscheduled DNA synthesis
UF	uncertainty factor (safety factor)
ULV	ultra low volume
UV	ultraviolet
v/v	volume ratio (volume per volume)
WBC	white blood cell
wk	week

wt	weight
w/v	weight per volume
ww	wet weight
w/w	weight per weight
XRFA	X-ray fluorescence analysis
yr	year
<	less than
⇔	less than or equal to
>	greater than
⇓	greater than or equal to

Part 2 Organizations and Publications

ACPA	American Crop Protection Association
ASTM	American Society for Testing and Materials
BA	Biological Abstracts (Philadelphia)
BART	Beneficial Arthropod Registration Testing Group
CA	Chemical Abstracts
CAB	Centre for Agriculture and Biosciences International
CAC	Codex Alimentarius Commission
CAS	Chemical Abstracts Service
CCFAC	Codex Committee on Food Additives and Contaminants
CCGP	Codex Committee on General Principles
CCPR	Codex Committee on Pesticide Residues
CCRVD	Codex Committee on Residues of Veterinary Drugs in Food
CE	Council of Europe
CIPAC	Collaborative International Pesticides Analytical Council Ltd
COREPER	Comite des Representants Permanents
EC	European Commission
ECB	European Chemical Bureau
ECCA	European Crop Care Association
ECDIN	Environmental Chemicals Data and Information Network of the European Communities
ECDIS	European Environmental Chemicals Data and Information System
ECE	Economic Commission for Europe
ECETOC	European Chemical Industry Ecology and Toxicology Centre
ECLO	Emergency Centre for Locust Operations
ECMWF	European Centre for Medium Range Weather Forecasting
ECPA	European Crop Protection Association
EDEXIM	European Database on Export and Import of Dangerous Chemicals
EHC (number)	Environmental Health Criteria (number)
EINECS	European Inventory of Existing Commercial Chemical Substances
ELINCS	European List of New Chemical Substances
EMIC	Environmental Mutagens Information Centre
EPA	Environmental Protection Agency
EPO	European Patent Office
EPPO	European and Mediterranean Plant Protection Organization
ESCORT	European Standard Characteristics of Beneficials Regulatory Testing
EU	European Union
EUPHIDS	European Pesticide Hazard Information and Decision Support System
EUROPEM	European Predictive Operator Exposure Model
FAO	Food and Agriculture Organization of the UN
FOCUS	Forum for the Co-ordination of Pesticide Fate Models and their Use
FRAC	Fungicide Resistance Action Committee
GATT	General Agreement on Tariffs and Trade
GAW	Global Atmosphere Watch
GIFAP	Groupeement International des Associations Nationales de Fabricants de Produits Agrochimiques (now known as GCPF)
GCOS	Global Climate Observing System
GCPF	Global Crop Protection Federation (formerly known as GIFAP)

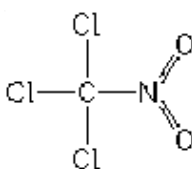
GEDD	Global Environmental Data Directory
GEMS	Global Environmental Monitoring System
GIEWS	Global Information and Early Warning System for Food and Agriculture
GRIN	Germplasm Resources Information Network
HRAC	Herbicide Resistance Action Committee
IARC	International Agency for Research on Cancer
IATS	International Academy of Toxicological Science
IBT	Industrial Bio-Test Laboratories
ICBB	International Commission of Bee Botany
ICBP	International Council for Bird Preservation
ICES	International Council for the Exploration of the Seas
ICPBR	International Commission for Plant-Bee Relationships
ILO	International Labour Organization
IMO	International Maritime Organisation
IOBC	International Organization for Biological Control of Noxious Animals and Plants
IPCS	International Programme on Chemical Safety
IRAC	Insecticide Resistance Action Committee
IRC	International Rice Commission
ISCO	International Soil Conservation Organization
ISO	International Organization for Standardization
IUPAC	International Union of Pure and Applied Chemistry
JECFA	FAO/WHO Joint Expert Committee on Food Additives
JFCMP	Joint FAO/WHO Food and Animal Feed Contamination Monitoring Programme
JMP	Joint Meeting on Pesticides (WHO/FAO)
JMPR	Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Expert Group on Pesticide Residues (Joint Meeting on Pesticide Residues)
NATO	North Atlantic Treaty Organisation
NAFTA	North American Free Trade Agreement
NCI	National Cancer Institute (USA)
NCTR	National Centre for Toxicological Research (USA)
NGO	non-governmental organization
NTP	National Toxicology Programme (USA)
OECD	Organization for Economic Co-operation and Development
OLIS	On-line Information Service of OECD
PAN	Pesticide Action Network
RNN	Re-registration Notification Network
RTECS	Registry of Toxic Effects of Chemical Substances (USA)
SCPH	Standing Committee on Plant Health
SETAC	Society of Environmental Toxicology and Chemistry
SI	Système International d'Unités
SITC	Standard International Trade Classification
TOXLINE	Toxicology Information On-line
UN	United Nations
UNEP	United Nations Environment Programme
WCDP	World Climate Data Programme
WCP	World Climate Programme
WCRP	World Climate Research Programme
WFP	World Food Programme
WHO	World Health Organization
WTO	World Trade Organization
WWF	World Wildlife Fund

APPENDIX 2 Listing of end points

Chapter 2.1: Identity, physical and chemical properties, details of uses, further information, and proposed classification and labelling

Active substance (ISO Common Name)	Chloropicrin
Function (e.g. fungicide)	Fungicide, insecticide, nematocide, bactericide
Country to which application is made	Italy

Identity

Chemical name (IUPAC)	Trichloronitromethane
Chemical name (CA)	Trichloronitromethane
CIPAC No	298
CAS No	76-06-2
EEC No (EINECS or ELINCS)	EINECS: 200-930-9
FAO Specification (including year of publication)	No FAO specification
Minimum purity of the active substance as manufactured (g/kg)	>990 g/kg
Identity of relevant impurities (of toxicological, environmental and/or other significance) in the active substance as manufactured (g/kg)	No relevant impurities
Molecular formula	CCl ₃ NO ₂
Molecular mass	164.4
Structural formula	

Physical-chemical properties

Melting point (state purity)	Freezing point: -70°C
Boiling point (state purity)	114°C at atmospheric pressure of 757.2 mm Hg
Temperature of decomposition	Not relevant
Appearance (state purity)	Colourless non-viscous liquid
Relative density (state purity)	1.667 g/mL at 25.7°C
Surface tension	1g/l solution = 71.0 mN/m (not surface active)
Vapour pressure (in Pa, state temperature)	2670 Pa (20.8°C)
Henry's law constant ($\text{Pa m}^3 \text{mol}^{-1}$)	$43.89 \text{ Pa m}^3 \text{mol}^{-1}$
Solubility in water (g/l or mg/l, state temperature)	10 g/L (25.7°C)
Solubility in organic solvents (in g/l or mg/l, state temperature)	> 0.5 g/mL (27.5°C) Hexane, Xylene, Ethanol, Acetone Soluble in the following solvents: heptane (755g/kg), 1,2-dichloro-ethane (413 g/kg), methanol (626 g/kg), ethyl acetate (563 g/kg), 1,3-dichloro-propene (417 g/kg)
Partition coefficient ($\log P_{\text{ow}}$) (state pH and temperature)	pH 7: $K_{\text{ow}} = 2.5$ (25°C)
Hydrolytic stability (DT_{50}) (state pH and temperature)	No hydrolytic products formed at level >10% at pH 5, 7 (acetate and phosphate systems) and 9 at 25°C
Dissociation constant	Not relevant – does not dissociate
UV/VIS absorption (max.) (if absorption > 290 nm state ϵ at wavelength)	Neutral aqueous solution: λ_{max} : 203.7 nm (ϵ 1648), 274.0 nm (ϵ 32) Acidified aqueous solution: λ_{max} : 204.4 nm (ϵ 1512), 274.2 nm, (ϵ 28) Basified aqueous solution: λ_{max} : 275 nm (ϵ 33)
Photostability (DT_{50}) (aqueous, sunlight, state pH)	pH 7: 31.1 hours in sterile aqueous buffer solution (25°C)
Quantum yield of direct phototransformation in water at $\lambda > 290 \text{ nm}$	0.5699
Flammability	Not flammable
Explosive properties	Not explosive

Classification and proposed labelling

with respect to
physical/chemical data

Classification:	None required
Proposed Label:	
Symbol:	None required
Indication of danger:	None required
Risk Phrases:	None required
Safety Phrases:	None required

with respect to toxicological
data

Classification:	Very toxic, R26 Harmful, R22 Irritant, R36/37/38
Proposed Label:	
Symbol:	T+
Indication of danger:	Very toxic
Risk phrases:	R22, R26, R36/37/38, R48/22
Safety phrases:	S1/2, S4, S7, S9, S26, S36/37, S38, S45

with respect to fate and
behaviour data

Classification:	None required
Proposed Label:	
Symbol:	None required
Indication of danger:	None required
Risk phrases:	None required
Safety phrases:	None required

with respect to ecotoxicological
data

Classification:	N, R50-53
Proposed Label:	
Symbol:	N
Indication of danger:	Dangerous for the environment
Risk phrases:	R50-53
Safety phrases:	S60, S61

Chapter 2.2: Methods of analysis

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

Technical as (principle of method)	a) GC/MS b) GC, FID-detection
Impurities in technical as (principle of method)	a) GC/MS b) GC, FID-detection
Plant protection product (principle of method)	GC, ECD-detection

Analytical methods for residue (Annex IIA, point 4.2)

Food/feed of plant origin (principle of method and LOQ for methods for monitoring purposes)	GC-ECD or GC-MS; tomato 0.005 mg/kg
Food/feed of animal origin (principle of method and LOQ for methods for monitoring purposes)	No data, justification given
Soil (principle of method and LOQ)	GC-ECD, 0.05 mg/kg
Water (principle of method and LOQ)	GC-ECD, 0.1 µg/L
Air (principle of method and LOQ)	GC-ECD, 0.1 µg/tube = 0.83 µg/m ³
Body fluids and tissues (principle of method and LOQ)	Fresh urine, blood GC-ECD or GC-MS, 0.05 mg/L Body tissues GC-ECD, 0.01 mg/kg

Chapter 2.3: Impact on human and animal health

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

Rate and extent of absorption:	Readily absorbed orally. Maximum blood concentrations of radioactivity between 6-24 hours after dosing
Distribution:	Small amounts of total radioactivity were found in tissues, mainly in the stomach and liver.
Potential for accumulation:	No evidence of accumulation
Rate and extent of excretion:	Mainly excreted via expired air (50% of oral dose). Excretion in urine = 20-30% of dose and in faeces = 10-15% of dose
Metabolism in animals	The principal initial reactions of CCl_3NO_2 in the cell involve rapid dechlorination to CHCl_2NO_2 . CCl_3NO_2 oxidises protein thiols with formation of disulfide bonds. It is proposed that the initially formed GS- CCl_2NO_2 metabolite either reacts further with GSH forming CHCl_2NO_2 and CH_2ClNO_2 or is cleaved by cysteine β -lyase, leading to raphanusamic acid. CCl_3NO_2 is also metabolised into CHCl_2NO_2 and CH_2ClNO_2 by liver microsomes and liver cytosol.
Toxicologically significant compounds (animals, plants and environment)	The parent compound and its metabolites

Acute toxicity IIA 5.2 (EU-Annex IIA, point 5.2)

Rat LD ₅₀ oral	250 mg/kg
Rat LD ₅₀ dermal	Not reported
Rat LC ₅₀ inhalation	0.044 mg/l
Skin irritation	Irritant; R38
Eye irritation	Irritant; R36
Inhalation irritant	Irritant; R37
Skin sensitization (test method used and result)	No classification

Short term toxicity (OECD data point IIA 5.3)

Target / critical effect

Mortality, decreased body weight and food consumption, changes in haematology and/or clinical chemistry parameters, increased absolute and relative lung weight, and microscopic lesions in the nasal cavities, lungs and stomach

Lowest relevant oral NOAEL / NOEL

8 mg/kg bw (90 day rat oral study)

Lowest relevant inhalation NOAEL / NOEL

<0.54 mg/kg bw – rat

Lowest relevant dermal NOAEL / NOEL

No information available

Genotoxicity IIA 5.4 (EU-Annex IIA, point 5.4)

1.1.2

Weakly genotoxic in vitro. Non-genotoxic in vivo.

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

Target/critical effect

Mortality, hyperplasia and hyperkeratosis in the nonglandular stomach after chronic oral administration, toxic effects in respiratory tissue after Chloropicrin chronic vapour exposure

Lowest oral NOAEL / NOEL

0.1 mg/kg bw (2 year rat)

Lowest inhalation NOAEL / NOEL

0.18 mg/kg bw (2 year rat study)

Carcinogenicity

No carcinogenic potential

Reproductive toxicity IIA 5.6 (EU-Annex IIA, point 5.6)

Reproduction target / critical effect

None

Lowest relevant reproductive NOAEL / NOEL

> 2.71 mg/kg bw

Developmental target / critical effect

increased incidence of skull bone reduced ossification

Lowest relevant developmental NOAEL / NOEL

2.17 mg/kg bw

Neurotoxicity / Delayed neurotoxicity IIA 5.7 (EU-Annex IIA, point 5.7)

Acute neurotoxicity

No information available

Subchronic neurotoxicity

No information available

Other toxicological studies IIA 5.8 and IIA 5.10 (EU-Annex IIA, point 5.8)

Sensory irritation study in mice (RD50)

2.34 ppm

Sensory irritation study in humans

Mild sensory irritant at 0.1 and 0.15 ppm.
BMCL10 = 0.073 ppm

Medical data IIA 5.9 (EU-Annex IIA, point 5.9)

A number of incidences are reported which occurred when workers were using Chloropicrin as a fumigant. Symptoms included: excessive lacrimation, coughing, vertigo, headache, nausea, vomiting, and fatigue. Chloropicrin is intensely irritating to the eyes, with an effect like 'tear-gas' in concentrations of 0.3-0.37 ppm. It results in painful irritation to the eyes in 3-30 seconds. It has been reported that effects from exposure to Chloropicrin are rare, in part due to warning responses including transient, reflex stinging or burning eyes that occur at low airborne Chloropicrin concentrations (0.15 ppm to 0.37 ppm). This reversible response is referred to as the "warning property" of Chloropicrin.

**Summary IIA 5.11
(EU-Annex IIA, point 5.10)**

ADI
AOEL (operator, worker)
AOEL (bystander)

Drinking water limit
ARfD (acute reference dose)

Value

Study

Safety factor

0.001 mg/kg bw/day	Rat, 2 year oral study	100
0.002 mg/kg bw/day	90-day rat inhalation study	300
0.0075 ppm	Human sensory irritation study	10
0.1 µg/l		
0.001 mg/kg bw	1 year dog study	100

Dermal absorption IIA 5.9.9 and IIIA 7.6 (EU-Annex IIIA, point 7.3)

No data: Default value (100%) proposed.

Acceptable exposure scenarios (including method of calculation)

Operator	Field exposure measurements showed that operator exposures were below the systemic AOEL only when RPE is worn. Without RPE: 2962% RPE: 74%
Workers	Field exposure measurements showed that worker exposures were below the systemic AOEL. VIF cutting: without RPE: 120-1895% with RPE: 47% VIF removal: 54.5% Estimation of exposure during transplanting in soil was below the systemic AOEL (5%)
Bystanders	Field exposure measurements showed that bystander exposures were below the AOEL only if located 50 m from the treated area. AOEL: 320% (1 m) AOEL: 308% (20 m) AOEL: 49% (50 m)

Chapter 2.4: Residues

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

Plant groups covered	Fruit (strawberries); Root Vegetable (red beet); Pulses (green beans)
Rotational crops	No data, justification given
Plant residue definition for monitoring	Chloropicrin (parent compound)
Plant residue definition for risk assessment	Chloropicrin (parent compound)
Conversion factor (monitoring to risk assessment)	None

Metabolism in livestock

Animals covered	No data, justification given
Animal residue definition for monitoring	Not applicable
Animal residue definition for risk assessment	Not applicable
Conversion factor (monitoring to risk assessment)	Not applicable
Metabolism in rat and ruminant similar (yes/no)	Not applicable
Fat soluble residue: (yes/no)	No

Residue in succeeding crops

No data, justification given. No residues expected in succeeding crops. Residues will not exceed the LOQ proposed.
--

Stability of residues

Levels of Chloropicrin decreased under the freezer storage conditions over a 30 day period. Residues were seen to decline significantly between 2 and 15 days after placing in frozen storage.
--

Residues from livestock feeding studies

Not required as residues were not detected in any harvest sample and therefore there is no possible transfer to livestock.

Intakes by livestock: 0.1 mg/kg diet/day:

Muscle	Data was not required
Liver	Data was not required
Kidney	Data was not required
Fat	Data was not required
Milk	Data was not required
Eggs	Data was not required

Ruminant:	Poultry:	Pig:
No	No	No

Table 2.4-1: 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 mg/kg	STMR (b)
Tomato	UK (Northern Region)	$< 0.001 \times 4$	Residue levels of Chloropicrin were lower than the limit of detection	0.005	0.005 mg/kg
Tomato	Italy (Southern Region)	$< 0.005 \times 4$	Residue levels of Chloropicrin were lower than the limit of quantification	0.005	0.005 mg/kg
Tomato	Italy (Southern Region)	$< 0.005 \times 1$	Residue levels of Chloropicrin and Dichloronitromethane were both lower than the level of quantification	0.005	Not applicable since no residues were detected.

(a) Numbers of trials in which particular residue levels were reported *e.g.* $3 \times <0.01$, 1×0.01 , 6×0.02 , 1×0.04 , 1×0.08 , 2×0.1 , 2×0.15 , 1×0.17

(b) Supervised Trials Median Residue *i.e.* the median residue level estimated on the basis of supervised trials relating to the critical GAP

WARNING: This document forms part of an EC evaluation data package and should not be read in isolation. Registration must not be granted on the basis of this document.

Consumer risk assessment

ADI	0.001 mg/kg bw/d
TMDI (European Diet) (% ADI)	3,1% (PRIMO rev. 2 method from EFSA)
NEDI (% ADI)	Not applicable
Factors included in NEDI	Not applicable
ARfD	0.001 mg/kg bw
Acute exposure (% ARfD)	IESTI 1 = 58.1%; IESTI 2 = 42.1 %

Processing factors

Crop/processed crop	Number of studies	Transfer factor	% Transference*
No data required			

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

Proposed MRLs

Tomatoes.....	0.01 mg/kg
---------------	------------

Chapter 2.5: Fate and behaviour in the environment

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

Mineralization	72.2% after 24 days
Non-extractable residues	14.8% after 24 days
Relevant metabolites - name and/or code, % of applied (range and maximum)	In the unique study conducted in accordance with SETAC guidelin In other studies, some degradation products, such as nitromethane, chloronitromethane, dichloronitro-methane and chloroform, were found at levels <5%

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

Anaerobic degradation	Mineralization: not available Non-extractable residues: <11% after 54 days Nitromethane 3% after 5 d in soil fraction
Soil photolysis	Not applicable

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

Method of calculation

Laboratory studies (range or median, with n value, with r^2 value)

Field studies (state location, range or median with n value)

Soil accumulation and plateau concentration

Laboratory: linear first order kinetics
Field studies: first order kinetics not applied
Parent DT _{50lab} (20°C, aerobic): 3.9 – 26.9 d (n = 4)
DT _{50lab} (20°C, aerobic) mean value = 9.4 days
DT _{90lab} (20°C, aerobic): 13 - 89.3 days (n = 4) [Calculated]
DT _{90lab} (20°C, aerobic) mean value = 38.8 days
DT _{50lab} (10°C, aerobic): 9.8 d (n = 1) [Calculated for one soil out of four ones]
DT _{90lab} (10°C, aerobic): 33.6 d (n = 1)
DT _{50lab} (20°C, anaerobic): 6.9 – 20 hr (n = 1, no r^2 data available) in one soil; the study did not follow SETAC guidelines and GLP
Degradation in the saturated zone: no data submitted
DT _{50f} : 0.48-5.6 days in two soils
DT _{90f} : no data available and not required
No data required

Soil adsorption/desorption (Annex IIA, point 7.1.2)

K_f/K_{oc}

Freundlich adsorption coefficients (K_F) were calculated in four of the soils and were in the range 0.414 - 1.15.

Adsorption coefficients corrected for organic carbon content (K_{oc}) were in the range 24.9 - 122, indicating low affinity of Chloropicrin for soil. Using the McCall scale to assess potential mobility, Chloropicrin is classified as having a 'very high' to 'high' potential for mobility in soil.

K_{oc} mean value = 60.5 l/kg with a $1/n = 0.91$

DCNM

$K_d = 0.363$ from Aged column leaching study the corresponding K_{oc} value is 30.14 l/kg

K_d

The average K_d values for Chloropicrin and Dichloronitromethane based on the leachate volumes necessary for 50% elution were calculated to be 0.381 and 0.363, respectively.

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

Aged residues leaching

The study was carried out to OECD guidelines. The average K_d values for Chloropicrin and Dichloronitromethane based on the leachate volumes necessary for 50% elution from the columns were calculated to be 0.381 and 0.363, respectively.

The major breakdown product of Chloropicrin was found to be Dichloronitromethane with a formation fraction of 21%.

PEC (soil) Annex IIIA, point 9.3.1)

Method of calculation

FOCUS simple calculation:
 DT_{50} (d): 9.4 days (mean value)
Kinetics: 1st order

Application rate

Crop: Tomatoes
% plant interception: Pre-emergence therefore no crop interception
Number of applications: 1
Interval (d): 0
Application rate: 448 Kg/ha
Bulk density of soil = 1.5 g/cm³ dry weight.
Depth of the soil layer= 20 cm

In crop	Chloropicrin		DCNM	
Time	PEC soil actual [mg a.s./kg dw]	TWA conc. [mg a.s./kg dw]	PEC soil actual [mg met./kg dw]	TWA conc. [mg met./kg dw]
Initial	149.3	-	24.8	
Short term 24 h	138.7	144.0	23.0	23.9
2 d	128.9	138.3	21.4	23.0
4 d	111.2	129.3	18.5	21.5
Long term 7 d	89.1	116.6	14.8	19.4
14 d	53.2	93.1	8.8	15.5
21 d	31.7	75.9	5.3	12.6
28 d	18.9	63.2	3.1	10.5
50 d	3.7	46.0	0.6	6.6
100 d	0.1	20.2	0.02	3.4

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

Hydrolysis of active substance and relevant metabolites (DT₅₀) (state pH and temperature)

pH 5: no hydrolysis after 28 d;
pH 7: no hydrolysis occurred after 28 d
pH 9: no hydrolysis after 28 d

Photolytic degradation of active substance and relevant metabolites

DT₅₀: 1.3 days

Readily biodegradable (yes/no)

No

Degradation in - DT₅₀ water
water/sediment - DT₉₀ water

Not available
Not available

- DT₅₀ whole system
- DT₉₀ whole system

Not available
Not available

Mineralisation

Not available

Non-extractable residues

Not available

Distribution in water / sediment systems
(active substance)

Not available

Distribution in water / sediment systems
(metabolites)

Not available

PEC (surface water) and PEC (sediment)

Method of calculation

Contamination via drains:
- Soil DT₅₀ (d): 9.4 days mean value
- Kinetics: 1st order

Application rate

- Crop: Tomatoes
- % plant interception: Pre-emergence therefore no crop interception
- Number of applications: 1
- Interval (d): 0
- Application rate: 230.7 kg/ha (after 8 days of tarping)

Main routes of entry

Drainage

(Annex IIIA, point 9.2.3)

Scenario		1 st application date	PEC _{sw, max} [µg a.s./L]	PEC _{sed, max} [µg a.s./kg]
D6 Thiva	ditch	April	6.573	1.410
R2 Porto	stream	April	0.0	0.0
R3 Bologna	stream	April	0.0	0.0
R4 Roujan	stream	April	0.0	0.0

PEC (surface water) and PEC (sediment) – metabolite

Method of calculation

Not applicable

Application rate

Contamination via drains:
- Soil DT₅₀ (d): 9.4 days
- Kinetics: 1st order

Main routes of entry

- Crop: Tomatoes
- % plant interception: Pre-emergence therefore no crop interception
- Number of applications: 1
- Interval (d): 0
Formation rate: 21%
Application rate: 74.4 kg/ha

Scenario		1 st application date	PEC _{sw, max} [µg/L]	PEC _{sed, max} [µg/kg dw]
D6 Thiva	ditch	9 th April	4.350	0.779
R2 Porto	stream	22 nd April	0.0	0.0
R3 Bologna	stream	4 th April	0.0	0.0
R4 Roujan	stream	8 th April	0.0	0.0

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

Method of calculation and type of study
(e.g. modelling, monitoring, lysimeter)
Application rate

FOCUS PEARL and PELMO
Climate: All relevant locations
Soil: Various locations (Model defined)
Crops: Tomatoes.
Number of applications: 1
Application rate: 230.7 kg/h. (after 8 days of tarping)
Koc: 60.5 kg/l
Aerobic DT50: 9.4 days

PEC(gw) (µg/l)

Maximum concentration

PEARL 467.7 ug/L (Piacenza)
PELMO 87.5 ug/L (Piacenza)

Average annual concentration
80th percentile

PEARL 206.5 ug/L (Piacenza)
PELMO 49.1 ug/L (Piacenza)

PEC (ground water) for metabolites IIA 7.10 and IIIA 9.9 (EU-Annex IIIA, point 9.2.1)

Method of calculation and type of study
(e.g. _ modeling, monitoring, lysimeter)

FOCUS PEARL and PELMO
Climate: All relevant locations
Soil: Various locations (Model defined)

Application rate

Crops: Tomatoes.
Number of applications: 1
Formation rate: 21%
Koc: 30.14 (calculated from Kd)

PEC(gw) (µg/l)

Maximum concentration

PEARL 434.5 ug/L
PELMO 665.2 ug/L

Average annual concentration
80th percentile

PEARL 135.8 ug/L
PELMO 302.2 ug/L

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

Direct photolysis in air

Latitude: No data
Season: No data
DT₅₀: No data provided; scientific literature data report a DT₅₀ of 20 days (HSDB April 2005).

Metabolites: No data provided, but open scientific literature data indicate formation of metabolites in air as phosgene, nitric oxide, chlorine, nitrogen dioxide, dinitrogen tetroxide. Phosgene degrades into CO₂ and hydrogen chloride (HSDB April 2005).

Chloropicrin may have a not negligible effect on tropospheric ozone formation; it has been found to be a relatively reactive compound under simulated atmospheric conditions (Carter et al., 1997).

Quantum yield of direct phototransformation

No data available

Photochemical oxidative degradation in air

No data available

Volatilization

from plant surfaces: Not applicable

DWM of 0.0491 mg/m³ on the day of application

DWM maximum of 0.1702 mg/m³ on the day 4

PEC (air)

Method of calculation

No guidance is currently available to calculate PEC(air).

PEC_(a)

Maximum concentration

No guidance is currently available to calculate PEC(air).

Definition of the residue (Annex IIA, point 7.3)

Relevant to the environment

Chloropicrin, DCNM

Monitoring data if available (Annex IIA, point 7.4)

Soil (indicate location and type of study)

No data available

Surface water (indicate location and type of study)

No data available

Ground water (indicate location and type of study)

Of 16,561 wells sampled in California and Florida, USA from, only three wells had detectable Chloropicrin residues which ranged from 35 to 68 µg/l

Air (indicate location and type of study)

DWM of 0.0491 mg/m³ on the day of application
DWM maximum of 0.1702 mg/m³ on the day 4

Chapter 2.6 Effects on non-target species

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

Acute oral toxicity to mammals	LD ₅₀ 250 mg a.s./kg bw (rat)
Acute inhalation toxicity to mammals	4 hours LC ₅₀ 0.04 mg/L (rat)
90 day inhalation toxicity	NOEL <0.54 mg/kg bw – rat
Developmental study	NOAEL 2.17 mg/kg bw
Acute toxicity to birds	LD ₅₀ 62 mg a.s./kg bw
Dietary toxicity to birds	LC ₅₀ (Northern Bobwhite quail) 476 ppm a.s. (108 mg a.s./kg bw) NOEC (Mallard Duck) 562 ppm a.s. (243 mg a.s./kg bw)
Short-term inhalation toxicity to birds	5d LC ₅₀ >659 ppb 5 day NOAEL 96 ppb (0.647 mg/m ³)
Reproductive toxicity to birds	NOEC 100 ppm a.s.

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

Birds

Tier 2 TER Calculations for Chloropicrin: Acute, Short-Term and Long-Term Risk Assessment for Small Insectivorous Birds (Yellow wagtail) in Tomatoes.

For insectivorous birds, some of the refinements proposed are not sufficiently supported/documented and therefore it is concluded that an acceptable risk has not been demonstrated. The TER calculation is not reported here.

Tier 2 TER Calculations for Chloropicrin: Acute, Short-Term and Long-Term Risk Assessment for Small vermivorous Birds (Passeriformes) in Tomatoes.

	FIR/bw	Concentration in diet (mg/kg)	PD	PT	AV	f _{twa}	ETE	Endpoint (mg/kg b.w./day)	TER	Trigger
Acute	1.90	2.67	0.25	0.33	0.5	0.6347	0.133	62	466	10
Short-term	1.90	2.67	0.25	0.33	0.5	0.2477	0.052	115.2	2215	10
Long-term	1.90	2.67	0.25	0.33	-	0.048	0.020	24.2	1210	10

Tier 2 TER Calculations for Chloropicrin: Acute, Short-Term and Long-Term Risk Assessment for Medium Herbivorous Birds (Woodpigeon feeding on non-grass herbs) in Tomatoes

	FIR/bw	Concentration in diet (mg/kg)	PD	PT	AV	f _{twa}	ETE	Endpoint (mg/kg b.w./day)	TER	Trigger
Acute	0.69	9.76	0.325	0.33	0.5	0.5929	0.214	62	289.7	10
Short-term	0.69	9.76	0.325	0.33	0.5	0.2143	0.077	115.2	1496	10
Long-term	0.69	9.76	0.325	0.33	-	0.041	0.030	24.2	807	10

Figures highlighted in **bold** are below the trigger values set by Annex VI of Directive 91/414 EEC

Tier 2 TER Calculations for Chloropicrin: Acute, Short-Term and Long-Term Risk Assessment for Medium Herbivorous Birds (Woodpigeon feeding on seeds) in Tomatoes

	FIR/bw	Concentration in diet (mg/kg)	PD	PT	AV	f _{twa}	ETE	Endpoint (mg/kg b.w./day)	TER	Trigger
Acute	0.076	0.76	0.51	0.33	0.5	0.5929	0.037	62	1676	10
Short-term	0.076	0.76	0.51	0.33	0.5	0.2143	0.013	115.2	8861	10
Long-term	0.076	9.767.285	0.51	0.33	-	0.041	0.005	24.2	4840	10

Figures highlighted in **bold** are below the trigger values set by Annex VI of Directive 91/414 EEC

Toxicity Exposure Ratio for Inhalation Exposure to Birds

Test species	Exposure Levels	Duration of exposure	End Point	TER	Trigger
Northern Bobwhite Quail	0.1636 mg/m ³ (mean day 4, north)	5 days	5 day NOAEL 96 ppb 0.647 mg/m ³	4	10
	0.0634 mg/m ³ (average over day 1-5, north)			10.2	

Mammals

The dietary risk assessment presented by the Notifier is not judged acceptable.

Toxicity data for aquatic species (most sensitive species of each group) (Annex IIA, point 8.2; Annex IIIA, points 10.1 and 10.3)

Group	Test substance	Time-scale	Endpoint	Toxicity (µg/l)
Laboratory tests				
<i>Oncorhynchus mykiss</i>	> 99% as	96 h	Mortality, LC ₅₀	4.8
<i>Lepomis macrochirus</i>	> 99% as	96 h	Mortality, LC ₅₀	48
<i>Daphnia magna</i> (Straus)	> 99% as	48 h	EC ₅₀	150
<i>Selenastrum capricornutum</i>	> 99% as	72 h	EC ₅₀	(E _b C ₅₀) 0.11 (E _r C ₅₀) 0.16
<i>Navicula pelliculosa</i>	Not accepted			
<i>Oncorhynchus mykiss</i>	> 99% as	90 days	NOEC	2.5 µg/l
<i>Daphnia magna</i> (Straus)	> 99% as	21 days	NOEC	4.27 µg/l
<i>Lemna minor</i>	> 99% as	7 days	EC ₅₀	E _b C ₅₀ 14.0 µg/l E _r C ₅₀ 37.9 µg/l E _{wt} C ₅₀ 6.80 µg/l
Microcosm or mesocosm tests:				
Not required.				

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

Test System	Test species	Effect Concentration (µg as/l)	PEC _{SW} (µg as/l)	TER	Trigger
Acute	Fish	4.8	6.573	0.7	< 100
Long Term (Early Life Stage)	Fish	NOEC: 2.5	6.573 (PECi)	0.4	< 10
			0.403 (50d PEC _{twa})	6	
Acute	Invertebrate	150	6.573	22.8	< 100
Long term (reproduction)	Invertebrate	NOEC: 4.27	6.573 (PECi)	0.6	< 10
			0.859 (21d PEC _{twa})	5	
Acute	Algae	0.11	6.573	0.017	< 10
Long term	Algae	Not accepted			
Acute	Aquatic plants	6.80	6.573	1.0	< 10

Bioconcentration

Bioconcentration factor (BCF)

Annex VI Trigger for the bioconcentration factor

Clearance time (CT₅₀)
(CT₉₀)

Level of residues (%) in organisms after the 14 day depuration phase

Not relevant as log P _{OW} <3
Not relevant
Not relevant
Not relevant

Effects on honey bees (Annex IIA, point 8.3.1; Annex IIIA, point 10.4)

Acute Inhalation toxicity (1h exposure)

48h LC50> 12,200 ppb
48h NOEC =12,200 ppb (82.2 mg/m³)

TER for inhalation exposure of honey bees (Annex IIIA, point 10.4)

Test species	Exposure Levels	End Point	TER	Trigger
Honeybee (<i>Apis mellifera</i>)	45.9 ppb 0.3077 mg/m ³ 1 meter from treated site	LC50> 12,200 ppb	> 266	10

Field or semi-field tests

Not required.

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

Species	Stage	Test Substance	Dose (L/ha)	Endpoint	Effect	Annex VI Trigger
Laboratory tests						
<i>Poecilus Cupreus</i>	Adult	> 99% as	Up to 816	Mortality Prey Consumption	100% 0%	> 50 %
<i>Pardosa Spp</i>	Adult	> 99% as	Up to 272	Mortality Prey Consumption	100% 0%	> 50 %
<i>Folsomia Candida</i>		> 99% as	Up to 3	Mortality Fertility	100% 100%	> 50 %
<i>Aleochara Bilineata</i>	Adult	> 99% as	Up to 816	Fertility	100%	> 50 %
Extended laboratory tests						
<i>Poecilus Cupreus</i>	Adult	> 99% as	272	Mortality Prey consumption	0% 4 DAT 6.9% 18 DAT 0% 4 DAT 0% 18 DAT	> 50 %
<i>Pardosa Spp</i>	Adult	> 99% as	272	Mortality Prey consumption	0% 4 DAT 0% 18 DAT 0% 4 DAT 0% 18 DAT	> 50 %
<i>Folsomia Candida</i>	Juvenile	> 99% as	272	Mortality Fertility reduction	100% 4 DAT 0% 18 DAT 100% 4 DAT 9% 18 DAT	> 50 % > 50 %
<i>Aleochara Bilineata</i>	Adult	> 99% as	272	Reproductive capacity	6% (reduction) At 4 DAT 1.02% (increase) at 18 DAT	> 50 %

Field or semi-field tests

Not required

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

Acute toxicity

LC₅₀: 37.75 mg a.s./Kg dw soil

Reproductive toxicity

No NOEC

Potential for recolonization demonstrated
but no prove of successful reproduction

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

PECs ini = 149.33 mg/kg (20 cm soil depth)

Application rate 448 (kg as/ha)	Crop	Time-scale	TER	Annex VI Trigger
Soil Injection	Pre-planting	Acute	0.253	< 10

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

Nitrogen mineralization

Lab test: effects <25% after application of 272 litres/ha (1 x MAR) up to 142d (end of study).
Field test: effects <25% in soil treated up to 400l/ha (1.5 x >MAR) after 29 days.

Carbon mineralization

Field test: No significant effects (>25%) in soil treated up to 400l/ha (1.5 x >MAR) after 29 days from application.

Bacterial population

Lab test: significant reduction of population of *Pseudomonas* bacteria and *Actinomycetes* up to 142d (end of study).
Field test: microbial populations showed a full recovery in viable numbers after 29 days from application.

Sewage treatment (IIA 8.7)

Effects on sewage treatment

30' EC₅₀ = (95% confidence limits, 5.3 – 7.4 mg/L).

Effects on Terrestrial Vascular Plants (IIA 8.12)

Monocots (Ryegrass, Corn)	NOEC 1ppm (6.7 mg/m ³)
Dicots (Rape, Sunflower, Cucumber, Soy)	4 periods of 6 hours exposure.

LEVEL III

CHLOROPICRIN

**PROPOSED DECISION WITH RESPECT TO THE
APPLICATION FOR INCLUSION OF THE
ACTIVE SUBSTANCE IN ANNEX I**

WARNING: This document forms part of an EC evaluation data package and should not be read in isolation. Registration must not be granted on the basis of this document.

3.1 BACKGROUND TO THE PROPOSED DECISION

Chloropicrin is the active substance used in a formulation "Chloropicrin 99" which contains >99% w/w Chloropicrin. It is a fungicide fumigant for pre-planting use in a variety of crops for the control of soil borne fungi and other diseases such as *Fusarium*, *Verticillium*, *Rhizoctonia*, *Phytophthora*, *Pyrenochaeta*, *Pythium*, *Sclerotinia*, *Sclerotium*, *Didymella*, and *Armillaria*. It is applied once per growing season at least 22 ± 2 days pre-planting, and stored in steel cylinders.

Chloropicrin 99 may be applied a maximum of once per annum at 272 l/ha (448 kg as/ha). It is applied by soil injection, and the soil is covered with tarp (tarpaulin) to contain the substance. Product application and tarp removal from treated areas, which occurs 8 days from application, must be effected by specialized and trained operators. Between the time when tarp is removed from treated areas and the time when crops start to be sown or transplanted 14 days must elapse.

Chloropicrin is very toxic by the inhalation route and has skin and eye irritancy properties. Due to the corrosive nature of Chloropicrin, for ethical reasons from an animal welfare perspective, acute toxicity testing cannot be performed by the oral or dermal route. In a 2-year oral toxicity and carcinogenicity study performed using rats a NOAEL in rats was determined to be 0.1 mg/kg/day. Two long term inhalation oncogenicity studies were also carried out, in rats (NOAEL for toxic effects of 0.18 mg/kg bw), and in mice (NOAEL of 0.33 mg/kg bw). Due to the lack of treatment related carcinogenic effects, the NOEL for oncogenicity was determined to be > 1.0 ppm (3.35 mg/kg bw). In *in vivo* genotoxicity testing, Chloropicrin did not show any evidence of causing chromosome damage when tested in a mouse micronucleus assay, in which the alteration of the PCE/NCE ratio provided evidence of target cells exposure. Moreover, Chloropicrin did not show any evidence of causing DNA damage when tested in a rat liver DNA repair (UDS) assay. Based on these findings, Chloropicrin is evaluated as non-genotoxic *in vivo*. In a whole body inhalation teratogenicity rabbit study the NOAEL of Chloropicrin was 0.4 ppm with regard to maternal toxicity, based on deaths, clinical signs, necropsy findings, reduced body weight and food consumption and body weight loss at the higher exposure groups. A marginal LOEL of 0.4 ppm with regard to development toxicity was proposed based on an increase in postimplantation losses up to 0.4 ppm. An ADI of 1 µg /kg/day, an AOEL of 0.1 ppm (0.67 mg/m³ as mean 8-hour TWA), and an ArfD of 0.0022 mg/kg bw/day are proposed.

Chloropicrin in technical production batches as manufactured is analysed by GC with detection by FID or MS, using chlorobenzene as internal standard. Residue analysis of Chloropicrin in crops, soil, air and urine is by gas chromatography with FID, ECD or mass selective detection. Chloropicrin is extracted with acidic acetone solution, acetone/phosphoric acid/sodium chloride or acetonitrile and partitioned into iso-octane or cyclohexane. The limit of quantitation for Chloropicrin is 0.005 mg/kg for tomatoes, 0.05 mg/kg for soil, 0.83 µg/m³ for air and 0.05 mg/l for urine.

Chloropicrin was not detected as an extractable or unextractable residue in the plant metabolism studies conducted in strawberries, red beet and green beans. Pre-planting residue trials in tomatoes produced residues below the limit of determination (0.005 mg/kg). Information was also provided on melon. No residue was found in melons. The residue of concern was defined on the basis of metabolism studies as Chloropicrin only. It has also been shown that Chloropicrin is not detected in plant parts after the area has been pretreated with Chloropicrin under field conditions. Calculation of the TMDI based on the proposed EU MRL of 0.01mg/kg in tomatoes presented in Table 1 Section 1.4.3.1

(summary of intended use Volume 1, Level 1) has shown that a maximum of 3,1% of the ADI would be consumed.

Chloropicrin may be relevant for the atmosphere. This compound and some of its metabolites may be relevant for surface water and groundwater, even though the relatively rapid degradation in soil and the volatility of Chloropicrin, should be taken in a due consideration as factors limiting the risk. Annual applications of Chloropicrin are carried out by soil injection and the area is tarped immediately afterwards so as to restrict volatilisation for 4-7 days. Contamination of surface water is possible by atmospheric deposition of Chloropicrin emissions from treated fields after application by injection into soil. The soil DT_{50lab} values for Chloropicrin, measured in 4 soils at 20 °C and 40% moisture holding capacity, ranged between 3.9 and 26.9 days. Currently there are no harmonised approaches to determine the exposure of surface waters to plant protection products via volatilisation. The half-life value of 26.9 days has been taken as the worst-case to determine predicted environmental concentrations in groundwater (PEC_{gw}). Hydrolysis is not an important route of degradation for Chloropicrin. At pH 5, 7, and 9 and 25 °C, the level of Chloropicrin remained relatively constant over a 28 day period. In the presence of light, photohydrolysis has shown to enhance the degradation of Chloropicrin in aquatic environments up to a DT_{50} of 31.1 hours. The major degradation products formed in the presence of water are CO_2 as well as chloride, nitrate, and nitrite ions. Henry's constant (13,625.1 Pa.m³.mol⁻¹), vapour pressure (2.66 mPa), and molecular weight (164.4), indicate that Chloropicrin will readily volatilise from field into the atmosphere at ambient temperature and pressure.

Chloropicrin is intended as a pre-planting soil fumigant applied once per season, in areas devoid of foliage. Chloropicrin is injected into the soil to a depth of 20 cm, and immediately covered with tarp, which is glued and pressed into the soil. Chloropicrin that may escape from under the tarp will quickly volatilise and vent upwards into the atmosphere. Since the tarp remains in place for 4-7 days after the application, it will prevent terrestrial vertebrates to gain access to the treated area only during this lapse of time. Chloropicrin is highly volatile and its half life in soil is 26.9 days; hence, after tarp removal and during aeration period (up to 14 days) possible exposure routes for birds, mammals and other non-target organisms are inhalation and oral. No data are available on acute, short-term and long-term toxicity of Chloropicrin to terrestrial vertebrates, birds and bees and the claimed self-limiting exposure, due to powerful lachrymatory and irritant properties of Chloropicrin, is worst case the TER values for daphnia are above the trigger values, the TER values for fish (drip irrigation, winter) and algae (drip irrigation and soil injection, winter) are below the relevant trigger values, indicating a acute risk to these species. A refined assessment should be presented to demonstrate that, under normal conditions of use and realistic exposure, Chloropicrin is not likely to pose a risk to aquatic organisms. Anyhow, since the calculated PEC values are not considered fully reliable (see Section Fate and Behaviour), the present assessment should be considered provisional pending on confirmation of the correctness of PEC data. Demand for further information are requested to the applicant (See Level IV – point 4.10 – Ecotoxicological section)

As soil fumigation is undertaken pre-planting and there is no residue detected in the initial crop following soil fumigation then it is very unlikely that there is any risk of residue uptake in succeeding crops. Similarly, as soil fumigation treatment is undertaken once per year per area, prior to crop planting, and given the ready degradability and volatility of Chloropicrin, it is unlikely that any significant uptake by succeeding crops will occur.

3.2 PROPOSED DECISION CONCERNING INCLUSION IN ANNEX I

[REDACTED]

The information in section 3.2 has been removed upon request by the EU Commission as it relates to risk management, recommendations or proposals.

LEVEL IV

CHLOROPICRIN

**FURTHER INFORMATION TO PERMIT A DECISION
TO BE MADE, OR TO SUPPORT A REVIEW OF THE
CONDITIONS AND RESTRICTIONS ASSOCIATED
WITH THE PROPOSED INCLUSION IN ANNEX I**

4.1 Identity of the active substance

The information supplied is sufficient to allow the active substance to be listed in Annex I.

4.2 Physical and chemical properties of the active substance

The information supplied is sufficient to allow the active substance to be listed in Annex I.

4.3 Data on application and further information

The information supplied is sufficient to allow the active substance to be listed in Annex I.

4.4 Classification, packaging and labelling

4.4.1 Classification and labelling

Hazard symbol T+, N

Indication of danger Very toxic
Harmful
Irritant
Dangerous for the environment

Risk Phrases: R22 Harmful if swallowed
R26 Very toxic by inhalation
R36/37/38 Irritating to eyes, skin and respiratory system
R48/22 Harmful: danger of serious damage to health by prolonged exposure if swallowed
R50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Safety Phrases: S1/2 Keep locked up. Keep out of the reach of children.
S4 Keep away from living quarters.
S7 Keep container tightly closed.
S9 Keep container in a well-ventilated place.
S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
S36/37 Wear suitable gloves and protective clothing.
S38 In case of insufficient ventilation wear suitable respiratory equipment
S45 In case of accident or you feel unwell seek medical advice immediately (show the label where possible).
S60 This material and its container must be disposed of as hazardous waste.
S61 Avoid release to the environment. Refer to special instructions / safety data sheets.

4.4.2 Packaging

Steel cylinder of 61 litres (see Annex B - point B.3.5)

4.5 Methods of analysis

The information supplied is sufficient to allow the active substance to be listed in Annex I.

4.6 Toxicology and metabolism

Specific toxicity tests on metabolite dichloronitromethane

4.7 Residue data

The information supplied is sufficient to allow the active substance to be listed in Annex I.

4.8 Environmental fate and behaviour

The information supplied is sufficient to allow the active substance to be listed in Annex I.

4.9 Ecotoxicology

Birds

Since Chloropicrin is applied to bare soil, a risk assessment for a small granivorous bird (finch) should be submitted.

For insectivorous birds, some of the refinements proposed are not sufficiently supported/documented.

Terrestrial vertebrates

The risk assessment presented by the Notifier is not judged acceptable. A new risk assessment based on a small omnivorous mammal (mouse) is required.

Aquatic organisms

A test with a second algae species is required (the one submitted was judged not acceptable). Algae are the most sensitive aquatic organisms.

Worms

The RMS proposes to wait for the results of the ongoing reproduction test for the assessment of a successful reproduction and determination of the time necessary for the full recovery of worm populations in the treated field.

4.10 Demand for further information- data that should be required and evaluated at member state level for the plant protection product Chloropicrin 99