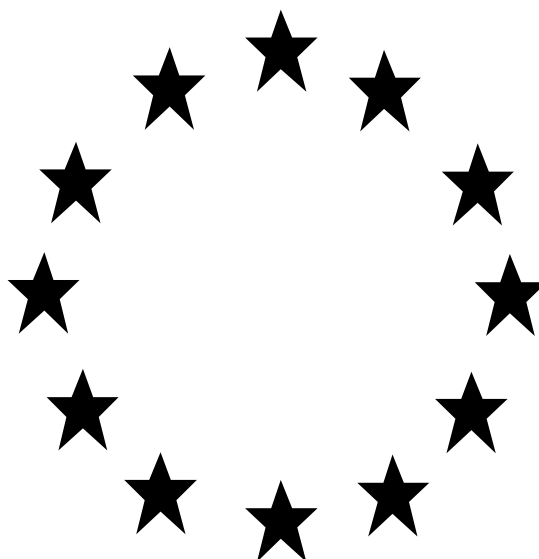




Additional Report to the DAR

- 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 3
Annex B7**

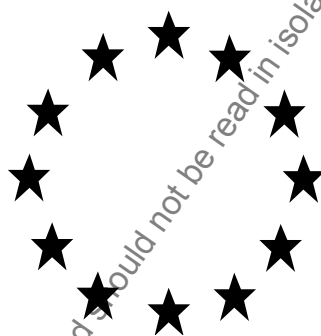
March 2010

Ministry of Health

Rome

Italy

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



Chloropicrin

Volume 3

Annex B.7: Residue data

March 2010

B.7 RESIDUE DATA

B.7.1 Metabolism, distribution and expression of residues in plants (Annex IIA 6.1, Annex IIIA 8.1)

The notifier indicated in their re-submission Dossier for inclusion in Annex I of Directive 91/414/EEC that the only crop being supported is tomatoes and residues trials were submitted on this basis. The notifier stated that drip irrigation is no longer supported for Annex I inclusion. However, residue data using a drip irrigation application is also provided here to demonstrate the absence of residues of Chloropicrin under any application process. Residue data available for melons is presented as further evidence that no residues are found in other crops grown after the treatment of soil with Chloropicrin.

B.7.1.1 Soil application

[¹⁴C]-Chloropicrin metabolism was investigated in strawberries, green beans, and red beets grown in casings filled with a silt loam soil.

Conclusions:

Chloropicrin was not detected in plant parts after being treated with Chloropicrin under field conditions. Only natural plant biochemical residues were present.

Response to comments from Member States:

The notifier confirmed that the application rate and climatic conditions used in this study are comparable to the proposed use of the product in Northern and Southern Europe.

The metabolism study is considered comparable to the GAP for the following reasons. The metabolism study was conducted in 1990 on a representative soil (silt loam). The level of Chloropicrin 99 applied to the soil in the metabolism study was also considerably higher than that of the proposed GAP which is, therefore, a worst-case application rate. Although the tarp covering the treated soil in the metabolism study was left for 2 days, compared to 8 days in the GAP, this is not considered relevant as the tarp is left on the soil for up to 8 days in order to prolong the activity of Chloropicrin in the soil. The highly volatile nature of Chloropicrin requires that tarp removal be delayed for up to 8 days as otherwise the Chloropicrin will be volatilised and no longer be present or effective in the soil. Chloropicrin will degrade rapidly in the soil and once the tarp is removed the remaining Chloropicrin will volatilise rapidly and therefore higher residues will not be found following a longer period of tarping. Residue levels in soil taken from the metabolism study are in agreement with this and show that residue levels in soil decreased rapidly following tarp removal, which is not considered to be related to the length of time the tarp is placed on the treated soil. In practice crops are planted 22 days after treatment thus allowing for Chloropicrin to dissipate to its full potential. This was not carried out as part of the metabolism study. Soil residue levels and potential plant uptake therefore, will be higher in the metabolism study than those which are likely to occur in normal practice. Therefore, it is considered that the metabolism study shows residue levels which are representative of normal use according to the proposed GAP. In relation to the issue of comparability of climates, weather records from a region in California and a region in Southern Europe have been reviewed and compared from the BBC Weather Centre (data from the UK met Office). When meteorological data from San Francisco are compared to data from Naples in Italy, it can be seen that average temperatures, relative humidity, and average precipitation are comparable, in both regions. Therefore, conditions present during the metabolism study carried out in Watsonville California are considered comparable to the conditions which would be found in Southern Europe.

The notifier provided information on the limit of detection as Chloropicrin was not detectable in any extract.

The metabolism study showed that at maturity, residue levels had declined substantially, ranging from 0.1 to 0.7 mg/kg in edible parts of the crops studied. Therefore, the limit of detection is considered to be <0.1 mg/kg. Analysis of the extracted residues and fractionated residues by HPLC and descending paper chromatography showed no detectable Chloropicrin in any of the sample extracts. Analysis identified the sodium bicarbonate extractable radiocarbon as glucose, fructose, and sucrose. The remaining unextracted residues were characterised by cell fractionation procedures and were found to be distributed among starch, protein, pectin, lignin, hemicellulose and cellulose. These residues are natural plant biochemical components. Total recovery of radioactive residues was between 82.2% and 117.6% for the method used, which is within the acceptable range of recovery, showing that Chloropicrin residues present would be detected by the method used. Furthermore, residue trials carried out in tomatoes in both Northern and Southern Europe have confirmed that Chloropicrin was not detectable in any of the samples. Chloropicrin will not be present in crops when Chloropicrin 99 is applied according to the proposed GAP. Therefore, as residues of Chloropicrin will not exceed the trigger value of 0.1 mg/kg of the total diet received and as tomatoes are not considered a food group which are fed to livestock, a study on metabolism, distribution and expression of residues in livestock is not considered relevant.

The notifier clarified as to whether Chloropicrin and chlorinated metabolites were detectable.

In the metabolism study the sodium bicarbonate extracts were the only portion of the total radioactivity with sufficient activity (>10% of TRR) to characterize. This extract was analysed by HPLC and contained polar, water soluble and ^{14}C compounds. Attempt to identify the polar compounds was performed using TLC analysis and confirmed the very polar nature of the extractable radiocarbon. The ^{14}C compounds were also analysed by descending paper chromatography which requires samples with high radioactivity. Representative chromatograms are presented in a supplement to the original report. The only residues of Chloropicrin in plants are carbon atoms which are metabolized as carbon dioxide. It is known that Chloropicrin degrades into carbon dioxide a natural constituent. The carbon then undergoes translocation through the plant. The only residues found in the extract were those of natural plant biochemical components.

The notifier clarified the situation with the time of harvest since crops exist which can be harvested much earlier after planting (e.g. radish, lettuce, spinach), and which might give not only higher residues, but also a different pattern of metabolism (metabolism less advanced):

Information on extraction of soil and identification of the radioactivity in soil extracts was also provided by the notifier.

Although data on residues in soil is helpful in a plant metabolism study, the main focus for carrying out studies relates to residues in plants. Therefore this data is not considered relevant according to Commission Directive 96/68/EC. In the plant metabolism study, total radiocarbon in the soil declined substantially during the study in the 0-6 inch layer, dropping from 35-50 ppm two days after dosing, to 5-10 ppm by the time the crops were harvested. This is almost certainly attributable to a loss of Chloropicrin from the soil through volatility. After fourteen days there was very little change in the total soil residue concentration with results obtained in an aerobic soil metabolism study which established that [^{14}C]Chloropicrin is readily converted to $^{14}\text{CO}_2$ in soil. It is likely that CO_2 formed under these field conditions would be readily absorbed by plant roots or remain in soil as carbonate

Further explanation was provided by the notifier on how the various extracts were identified e.g. protein, and also what is filtered.

The remaining unextracted residues were characterised by cell fractionation procedures and found to be distributed among starch, protein, lignin, hemicellulose and cellulose. As part of the fractionation of bound ^{14}C residues, 0.5 g dried residue was fractionated. Following the fractionation process, the suspension was vacuum filtered. Each filter cake was washed with a small volume of the appropriate buffer or reagent. Filtrates were distributed for LSC for identification of the residues.

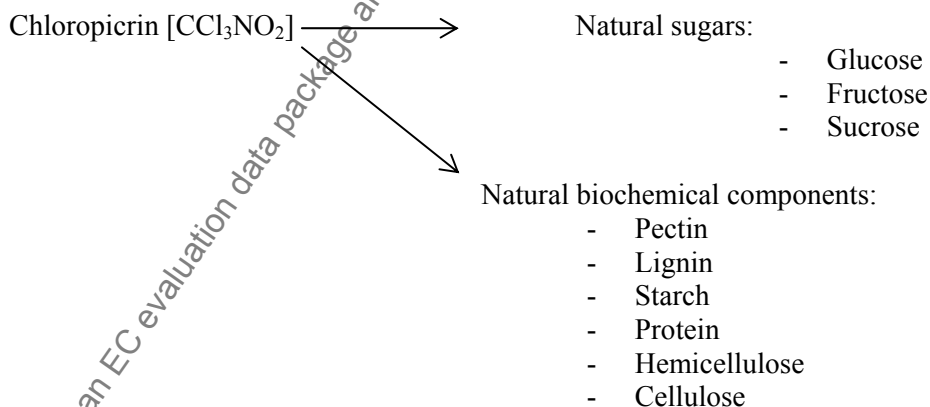
Residue trials carried out in tomatoes in both Northern and Southern Europe, have confirmed that Chloropicrin was not detectable in any of the samples. One additional trial was carried out on Dichloronitromethane, a degradation product of Chloropicrin in soil. No Dichloronitromethane was reported in any of the samples. This supports the fact that residues of Chloropicrin and Dichloronitromethane will not be present in crops. It also confirms that no chlorinated metabolites were detected in plant extracts analysed in the plant metabolism study.

B.7.1.2 Summary

Chloropicrin was not detected in plant parts after being treated with Chloropicrin under field conditions. Extractable and unextractable residues were made up of natural plant biochemical components of glucose, fructose, sucrose, starch protein, pectin, lignin, hemicellulose, and cellulose. These residues ranged from 1.9 to 8.4 mg/kg for all components of all crops 66 days after treatment and declined to 0.1 to 2.7 mg/kg after harvest.

The proposed metabolic pathway for chloropicrin is presented in Figure B.7.1.2-1. It is concluded that both plant and animal metabolism of chloropicrin results in the carbon of chloropicrin being incorporated into the single carbon pool from which it is incorporated into natural components such as starches and proteins, and expired via CO_2 .

Figure B.7.1.2-1: Proposed metabolic pathway for Chloropicrin



B.7.2 Metabolism, distribution and expression of residues in livestock (Annex IIA 6.2, Annex IIIA 8.1)

According to Commission Directive 96/68/EC, metabolism studies on animals, such as lactating ruminants (e.g. goat or cow) or laying poultry, are only required when pesticide use may lead to significant residues in livestock feed (≥ 0.1 mg/kg of the total diet received, except special cases e.g. active substances which accumulate).

It was demonstrated in the study outlined in section B.7.1 that when used as a pre-plant soil fumigant, Chloropicrin is metabolised by the plant into natural plant biochemical components.

The parent compound is not likely to be found in the raw agricultural commodities of the crops planted in soil treated with Chloropicrin. Furthermore, residue trials in tomatoes and melons have confirmed that the residue levels in crops are less than the limit of detection (see B.7.6.).

Comment: It is proposed that these studies are not relevant in this instance as Chloropicrin is not likely to exceed the trigger value of 0.1 mg/kg of the total diet received and does not accumulate.

Response to comments from Member States:

The notifier clarified that Chloropicrin or chlorine containing metabolites of chloropicrin will not be found in crops that are harvested very early and are used as livestock feed.

Furthermore the metabolism in the three crops investigated is similar, and these three crops are from three separate crop groups, metabolism is expected to be similar in all crops. Since the representative safe use proposed for chloropicrin is on tomatoes, for which no fraction of the crop is used in animal feedstuff, it is proposed that these studies are not relevant in this instance. The plant metabolism study confirms the absence of Chloropicrin and chlorinated metabolite in crops. Furthermore, no detectable residues (<0.005 mg/kg) of Chloropicrin were observed in the residue trials in either Northern or Southern Europe. Chloropicrin will not exceed the trigger value of > 0.1 mg/kg of the total diet received and does not accumulate.

B.7.3 Definition of the residue (Annex IIA 6.7 ; Annex IIIA 8.6)

Based on the metabolism data submitted for strawberries, red beets, and green beans, residues should be defined as Chloropicrin (parent compound) alone.

B.7.4 Use pattern

Full details of Good Agricultural Practice are given in Table 2 Section 1.4.3.1 (Volume 1, Level 1).

B.7.5 Identification of critical GAPs

Details of the GAP are provided in Table B 7.5.1.

Table B. 7.5-1: Good Agricultural Practices (GAPs) proposed for Chloropicrin.

Crop and/or situation	Member State or Country	Product name	F G or I	Pests or Group of pests controlled	Formulation		Application				Application rate per treatment			PHI (days)	Remarks:
					Type	Conc. of as	Method kind	growth stage & season	number min max	interval between applications	kg as/hL	water L/ha	kg as/ha		
					(d-f)	(i)	(f-h)	(j)	(k)	(min)	min max	min max	min max		
(a)			(b)	(c)										(l)	(m)
Trinity Manufacturing Inc.															
Pre-plant soil fumigation to tomatoes	N EU	De Ceuster-CP / K & S Chloro-fume		Nematodes, weeds, fungi, bacteria	Vapour (VP)	>99% w/w	Shank	Pre-plant	Max. one (1)	N/A	-	-	Up to 448	N/A	Application of Chloropicrin must be undertaken by trained applicators. Application to soil is one application per year per area.
Pre-plant soil fumigation to tomatoes	S EU	Tripicrin	F	Nematodes, weeds, fungi, bacteria	Vapour (VP)	>99% w/w	Shank	Pre-plant	Max. one (1)	N/A			Up to 448	N/A	Application of Chloropicrin must be undertaken by trained applicators. Application to soil is one application per year per area.

(a) For crops, the EU and Codex classifications (both) should be used; where relevant, the use situation should be described (e.g. fumigation of a structure)

(b) Outdoor or field use (F), glasshouse application (G) or indoor application (I)

(c) e.g. biting and sucking insects, soil born insects, foliar fungi, weeds

(d) e.g. wettable powder (WP), emulsifiable concentrate (EC), granule (GR)

(e) GCPF Codes - GIFAP Technical Monograph No 2, 1989

(f) All abbreviations used must be explained

(g) Method, e.g. high volume spraying, low volume spraying, spreading, dusting, drench

(h) Kind, e.g. overall, broadcast, aerial spraying, row, individual plant, between the plant - type of equipment used must be indicated

(i) g/kg or g/l

(j) Growth stage at last treatment (BBCH Monograph, Growth Stages of Plants, 1997, Blackwell, ISBN 3-8263-3152-4), including where relevant, information on season at time of application

(k) Indicate the minimum and maximum number of application possible under practical conditions of use

(l) PHI - minimum pre-harvest interval

(m) Remarks may include: Extent of use/economic importance/restrictions

B.7.6 Residue resulting from supervised trials (Annex IIA 6.3: Annex IIIA 8.2)

A storage stability study was requested by the Member States and it was submitted by the notifier. The summary and evaluation of this study is provided below.

B.7.6.1 Storage stability studies

Gandhi, J.S.G. Determination of Residues of Chloropicrin in Samples of Tomato Following One Month Freezer Storage in Compliance with Good Laboratory Practice. Oxford Analytical Ltd., UK. Unpublished report No. OA01656. Owner European Chloroprin Group. 2009. (IIA 6.1.1/01)

GLP: Yes

Methods:

Storage stability was investigated in tomatoes to determine the stability of Chloropicrin in samples following one month freezer storage. Untreated tomato samples were stored under frozen conditions (-18°C or below) until required for analysis. The untreated tomato samples were cut into two halves whilst still frozen; one half of the sample was returned to the freezer for retention.

The untreated tomato samples were cut into two halves whilst still frozen; one half of the sample was returned. Sufficient samples (36 units) of untreated homogenised tomato were weighed (~ 10 g) in polyethylene jars. 24 samples were treated with 10 ppb of Chloropicrin standard in acetone (nominal spiking level of 10 µg/kg). 12 samples remained untreated and used as control. All samples were capped to ensure no loss of Chloropicrin. Four spiked samples and 2 control samples were allocated to each time point. Two spiked and one control sample were kept in reserve. All samples were stored at ≤ - 18 °C until analysis.

At each time point, samples of prepared tomato were extracted in accordance with the following procedure.

A solution of 25% phosphoric acid with 5% sodium chloride and acetone (80:20) was added to the sample, then 1ml (glycerine:1%phosphoric acid) was added followed by 10ml n-Hexane. The jar was then sealed with a screw top cap, shaken for 5hrs on an orbital shaker. The sample was then allowed to settle. The aqueous layer was removed as completely as possible and 60ml of 1% phosphoric acid was added. The sample was then shaken vigorously by hand for 10 seconds. The sample was then centrifuged at 1700 rpm for 10 min. Finally, aliquots of the upper hexane layer were taken for quantification by GC/MSD.

Results:

Chloropicrin residues were seen to decline significantly between 2 and 15 days after placing in frozen storage. Storage stability samples of tomatoes yielded recoveries of 99.9 % and 99.3 % on day 0 and of 50.3 % and 52.2 % after 7 days. At 30 days, Chloropicrin was found to be below the limit of detection (LOD), 1 ng/ml (equivalent to 1 ppb, 1µg/kg of the sample).

A summary of the results from the storage stability is given in Table B.7.6-1. The overall procedural recovery ranged from 94.05 to 108.85 %. These results indicate that the analytical method was performed correctly for the analyses conducted in this study.

After 30 days freezer storage, the levels of chloropicrin in spiked samples of tomato were found to be below the level of detection (LOD), this being 1 ng/ml (equivalent to 1 ppb = 1µg/kg of the sample). The results obtained from the study show a decline of Chloropicrin

over the 30 day period. This indicates that the levels of Chloropicrin decreased under the freezer storage conditions used.

Table B.7.6-1 Freezer storage recovery results for spiked samples following storage at $\leq -18^{\circ}\text{C}$

Description	Time (Days)	Mass sample (kg)	Chloropicrin Determined ($\mu\text{g/kg}$)	Amount spiked ($\mu\text{g/kg}$)	Chloropicrin Recovered (%)	Mean Chloropicrin Recovered (%)
F53807/3 (T0A)	0	0.01004	10.772	10.779	99.9	99.6
F53807/3 (T0B)	0	0.01006	10.686	10.758	99.3	
F53807/3 (T2A)	2	0.01003	8.917	10.790	82.6	84.85
F53807/3 (T2C)	2	0.01006	9.371	10.758	87.1	
F53807/3 (T7A)	7	0.01006	5.407	10.758	50.3	50.25
F53807/3 (T7B)	7	0.01008	5.610	10.737	52.2	
F53807/3 (T15A)	15	0.01008	1.202	10.737	11.2	12.00
F53807/3 (T15B)	15	0.01009	1.369	10.726	12.8	
F53807/3 (T30A)	30	0.01002	N/A	10.801	<LOD	<LOD
F53807/3 (T30B)	30	0.01009	N/A	10.726	<LOD	

Conclusions:

The results obtained from this study show a decline of Chloropicrin over the 30 day period under freezer storage conditions. At the end of the study the levels of Chloropicrin in spiked samples of tomato were found to be below the level of detection (LOD), this being 1 ng/ml.

The study is considered acceptable.

B.7.6.2 Summary of supervised residue trials generated according to critical or intended GAP

In previous residue trials from 1999 and 2000, residue samples were obtained from treated and untreated tomatoes and melons harvested from four field trials and two glasshouse trials carried out at two locations in Italy (North Italy- Albenga, Savona (Liguria) and South Italy- Acate, Ragusa (Sicily)) in 1999 and 2000. The test material was Chloropicrin, contained in

the commercial product Tripicrin™. Applications to the soil were made pre-planting at two application rates, 20 g/m² and 40 g/m² by either soil fumigation or drip irrigation. The trials were carried out in accordance with EU guidelines (96/68/EC). Residue data on melons is presented as further evidence that no residues are found in other crops grown after the treatment of soil with Chloropicrin.

The residue data indicates that residues should not be detectable at harvest, and that residues in crops will be less than 0.01 mg/kg (i.e. < LOD), when Chloropicrin is applied (one application to soil per season) at 396 kg as/ha no later than 14 days pre-planting.

Conclusions:

This study is acceptable – Residues should not be detectable at harvest and residues in crops will be less than 0.01 mg/kg when Chloropicrin is applied at pre-determined levels.

In addition to the trials carried out in 1999 and 2000, the notifier provided further trials to complete the data package as requested by the Member States and the RMS. Four trials in Northern Europe and four trials in Southern Europe were carried out in tomatoes in 2008 by shank application. Drip irrigation is not supported. However residue data using drip irrigation is provided here to demonstrate the absence of residues of Chloropicrin under any application process.

Couldridge, C. Residues of Chloropicrin in Outdoor Grown Tomatoes following a Single Application via Drip Irrigation or Shank Fumigation. Oxford Agricultural Trials Ltd., UK. Unpublished report No. 671-08-RIV-TOM. Owner European Chloropicrin Group. 2009. (IIA 6.3.1/03)

Gandhi, J.S.G. Analysis of Residues of Chloropicrin in Outdoor Grown Tomatoes with Associated Validation in Compliance with Good Laboratory Practice. Oxford Analytical Ltd., UK. Unpublished report No. OA01626. Owner European Chloropicrin Group. 2009. (IIA 6.3.1/04)

GLP: Yes

Methods:

The purity of the test material was 99.3 % and the batch number was 008-070A. Residue samples were obtained from treated and untreated tomatoes harvested from four field trials carried out at trial sites located across a range of the horticultural regions in the UK (East Malling (Kent), Stratton Audley (Oxfordshire), Great Bolas (Shropshire) and Wood Enderby (Lincolnshire)) in 2008.

Chloropicrin was applied according to commercial practices. Application of the test item was conducted using a specialist contractor to simulate commercial application. Chloropicrin was applied at 448 kg/ha to bare soil via drip irrigation or shank fumigation 22 (± 2) days before planting tomatoes. Each trial consisted of 2 treated plots (one treated by shank and the second by drip) and one untreated plot.

Weather conditions were within the normal range of the different locations. At harvest, samples were deep frozen at – 18 °C and shipped to the analytical laboratory shortly after.

Untreated samples were processed prior to the treated samples. Tomato samples were cut in half whilst semi-frozen. One half of the sample was returned to the freezer for retention; the remaining half was processed using a Tecator T1904 Homogeniser. Samples of homogenised tomato were weighed (~ 10 g) in a polyethylene jar. 25 % phosphoric acid with 5 % sodium

chloride and acetone, in the ratio 80:20, V:V (40 ml: 10 ml) was added, then 1 ml (glycerine: 1 % phosphoric acid, 50:50, V:V) was added followed by 10 ml n-Hexane. The jar was then sealed with a screw top cap, shaken for 5 hrs on an orbital shaker, then removed and allowed to settle. Next, the aqueous layer was removed as completely as possible leaving the hexane layer, to which 60 ml of 1 % phosphoric acid was added and shaken vigorously by hand for 10 seconds. The sample was then centrifuged at 1700 rpm for 10 minutes. Finally, aliquots of the upper hexane layer were taken for quantification by GC/MSD.

Results:

Trials are summarized in Tables B.7.6-2 and B.7.6-3. The residue data clearly indicates that residues were not detectable at harvest, and that residues in crops will be less than 0.001 mg/kg (i.e. < LOD, when Chloropicrin is applied (one application to soil per season) at 448 kg as/ha no later than 22 ($\pm$ 2) days before planting. No additional residue trials are required in Northern Europe.

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

Table B.7.6-2: Summary of Residue Trials in Tomato (Residues Study 671-08-RIV-TOM) in the UK (Application by Shank Fumigation to Bare Soil, Pre-Planting)

Trial reference number	Year	Application rate kg as /ha	PHI	Residues found (mg/kg)	Recovery data
671/RIV/1	2008	460.33	77 days	<0.001 (LOD)	At 5 µg/kg : 89.4 % At 10 µg/kg : 98.5 %
671/RIV/2	2008	488.04	75 days	<0.001 (LOD)	At 5 µg/kg : 89.4 % At 10 µg/kg : 98.5 %
671/RIV/3	2008	479.924	67 days	<0.001 (LOD)	At 5 µg/kg : 89.4 % At 10 µg/kg : 98.5 %
671/RIV/4	2008	483.70	65 days	<0.001 (LOD)	At 5 µg/kg : 89.4 % At 10 µg/kg : 98.5 %

Table B.7.6-3: Summary of Residue Trials in Tomato (Residues Study 671-08-RIV-TOM) in the UK (Application by Drip Irrigation to Bare Soil, Pre-Planting) only provided for information purposes

Trial reference number	Year	Application rate kg as /ha	PHI	Residues found (mg/kg)	Recovery data
671/RIV/1	2008	443.14 - 452.57	67 days	<0.001 (LOD)	At 5 µg/kg : 89.4 % At 10 µg/kg : 98.5 %
671/RIV/2	2008	443.14 - 452.57	75 days	<0.001 (LOD)	At 5 µg/kg : 89.4 % At 10 µg/kg : 98.5 %
671/RIV/3	2008	443.14 - 452.57	67 days	<0.001 (LOD)	At 5 µg/kg : 89.4 % At 10 µg/kg : 98.5 %
671/RIV/4	2008	443.14 - 452.57	65 days	<0.001 (LOD)	At 5 µg/kg : 89.4 % At 10 µg/kg : 98.5 %

LOD = 0.001 mg/kg

Conclusions:

Residues are not detectable at harvest and residues in crops will be less than 0.001 mg/kg when Chloropicrin is applied at pre-determined levels.

The study is considered acceptable.

Zoboli, G. Residue Determinations of Chloropicrin in Tomatoes According to the OECD Principles of GLP (Good Laboratory Practice). Neutron, Italy. Unpublished report No. LN93-08. Owner European Chloropicrin Group. 2009. (IIA 6.3.1/05)

GLP: Yes

Methods:

Eight field trials were carried out in total. Four tomato trials were performed with Chloropicrin applied *via* drip irrigation. Another four trials were carried out with Chloropicrin applied *via* soil injection. The purity of the test material was 99.3% and it was assigned the batch number 008-070A. Residue samples were obtained from treated and untreated tomatoes harvested from four field trials carried out at trial sites located across a range of the horticultural regions in Italy (Albenga, Province of Savona in Liguria Region; Pralormà; Province of Torino in Piedmont Region; Sabaudia, Province of Latina in Lazio Region; and Latina in the Lazio Region) in 2008.

An authorised company delivered and applied Chloropicrin directly in the fields on the days of application. Chloropicrin was applied according to commercial practices. The target application rate of Chloropicrin was 452.53 kg/ha (448 kg a.s. /ha), applied to bare soil *via* soil injection or drip irrigation. It was applied 22 ($\pm$ 2) days before planting tomatoes. Each of the field trials for both applications *via* drip irrigation and *via* soil-injection consisted of an untreated plot and a treated plot.

Weather conditions were within the normal range of the different locations. At harvest, treated and untreated samples were stored in separate freezers, and were deep frozen at $\leq -18 \pm 2$ °C. The samples were shipped in separate containers to the analytical laboratory shortly after harvest.

Untreated samples were used for the validation of the analytical method. The samples to be analysed were prepared and extracted using the solvent phosphoric acid solution in acetone. After extraction, all of the extracts were put in a "GLP" refrigerator at ~ 4 °C for 16 hours. The extract solutions were analysed using Gas Chromatography (GC) using an Electron Capture Detector (ECD)Ni⁶³. Six replicate unspiked samples, six replicate spiked samples at LOQ level and six replicate spiked samples at 10 LOQ level were analysed. Analytical standards were prepared in order to check the linearity of the method. The samples were analysed in three replicates.

Results:

Trials are summarized in Tables B.7.6-4 and B.7.6-5. The residue data clearly indicates that residues were not detectable at harvest *via* drip irrigation or *via* soil injection, and that residues in crops will be less than 0.005 mg/kg (i.e. < LOQ), when Chloropicrin is applied (one application to soil per season) at 448 kg a.s./ha no later than 22 ($\pm$ 2) days before planting. No additional residue trials are required in Southern Europe.

Table B.7.6-4: Summary of Residue Trials in Tomato (Residues Study LN93-08) in Italy (Application by Shank Injection to Bare Soil, Pre-Planting)

Trial reference number	Year	Application rate kg as /ha	PHI	Residues found (mg/kg)	Recovery data
386.N.SAG08/r	2008	480.24	72 days	<0.005 (LOQ)	At 4.862 µg/kg: 83.9 – 85 % At 48.62 µg/kg: 86.6 %
387.N.SAG08/r	2008	491.33	65 days	<0.005 (LOQ)	At 4.842 µg/kg: 90.1 – 92.8 % At 48.42 µg/kg: 100.6 %
388.N.SAG08/r	2008	476.20	69 days	<0.005 (LOQ)	At 4.862 µg/kg: 84.5 – 85.2% At 48.62 µg/kg: 87.0 – 86.1 %
389.N.SAG08/r	2008	489.21	67 days	<0.005 (LOQ)	At 4.862 µg/kg: 84.5 – 85.2% At 48.62 µg/kg: 87.0 – 86.1 %

Table B.7.6-5: Summary of Residue Trials in Tomato (Residues Study LN93-08) in Italy (Application by Drip Irrigation to Bare Soil, Pre-Planting)

Trial reference number	Year	Application rate kg as /ha	PHI	Residues found (mg/kg)	Recovery data
382.N.SAG08/r	2008	449.01	68 days	<0.005 (LOQ)	At 4.862 µg/kg: 83.9 – 85 % At 48.62 µg/kg: 86.6 %
383.N.SAG08/r	2008	449.61	65 days	<0.005 (LOQ)	At 4.842 µg/kg: 90.1 – 92.8 % At 48.42 µg/kg: 100.6 %
384.N.SAG08/r	2008	447.37	70 days	<0.005 (LOQ)	At 4.862 µg/kg: 84.5 – 85.2% At 48.62 µg/kg: 86.1 - 87 %
385.N.SAG08/r	2008	446.85	67 days	<0.005 (LOQ)	At 4.862 µg/kg: 84.5 – 85.2% At 48.62 µg/kg: 86.1 - 87 %

LOQ = 0.005 mg/kg

Conclusions:

The residue data clearly indicates that residues were not detectable at harvest *via* drip irrigation or *via* soil injection, and that residues in crops will be less than 0.005 mg/kg (i.e. < LOQ)

The study is considered acceptable.

Ferrari, D. Determination of Residues of Chloropicrin and its Metabolite Dichloronitromethane in Protected Grown Tomato at Harvest Following a Single Application (Soil Drip and by Injection) of Chloropicrin 99 – One Trial in Italy – 2008 – 2009. Neutron, Italy. Unpublished report No. LN95. Owner European Chloropicrin Group. 2009. (IIA 6.3.1/06)

GLP: Yes

Methods:

Residue samples were obtained from treated and untreated tomatoes from one field trial in Italy following treatment with Chloropicrin 99. The purpose of the study was to determine the persistence of the active substance Chloropicrin and its metabolite Dichloronitromethane in tomatoes in/on the crop after the recommended number of treatments. Dichloronitromethane is a metabolite of Chloropicrin. In the aged residue column leaching study, Dichloronitromethane was identified as a potential metabolite in soil. Since Chloropicrin is applied pre-planting and rapidly degrades, both Chloropicrin and Dichloronitromethane are not expected to be present in tomatoes at harvest. This study was therefore carried out to confirm the absence of Dichloronitromethane. It was considered that only one trial would be performed.

One tomato trial was performed with Chloropicrin applied *via* drip application or *via* soil injection pre-planting of the crop. The purity of the test material was 99.3 % and it was assigned the batch number 008-070A. Residue samples were obtained from treated and untreated tomatoes harvested from one field trial carried out at one location, in Vittoria, Province of Ragusa, in Sicily region located in Southern Italy in 2008 - 2009.

An authorised company delivered and applied Chloropicrin directly in the fields on the days of application. Chloropicrin was applied according to commercial practices. The target application rate of Chloropicrin was 452.53 kg/ha (448 kg a.s. /ha), applied to bare soil *via* soil injection or drip application. The recommended dosage rate was applied with a maximum deviation of - 0.55 %. It was applied 20 days before planting tomatoes. The field trial for both application *via* drip irrigation and *via* soil-injection consist of an untreated plot and a treated plot. Sampling was carried out at harvest time, 88 DALA, and a second sampling was carried out at 109 DALA. The untreated samples were sampled before the treated samples.

At harvest, treated and untreated samples were stored in separate freezers, and were deep frozen at - 18 °C. The samples were shipped in separate containers to the analytical laboratory shortly after harvest.

The validation of the analytical method for the determination of the residues of Chloropicrin in tomatoes was carried out during the study LN93 – 2008. The validation of the analytical method for the determination of the residues of Dichloronitromethane in tomatoes was validated by Neutron Laboratory and was based on the Chloropicrin method.

The first set of samples, a total of three samples were analysed: 1 untreated sample and 2 treated samples. Every sample was divided into two aliquots: the first parts were intended for

Chloropicrin analysis and stored in a GLP freezer at $-25^{\circ}\text{C} \leq T \leq -10^{\circ}\text{C}$. The second aliquots were intended for Dichloronitromethane analysis and kept in a freezer at a temperature of -80°C . A second set of samples were received at a later date and were stored at a controlled temperature of $-25^{\circ}\text{C} \leq T \leq -10^{\circ}\text{C}$.

The samples to be analysed were prepared and extracted using the solvent phosphoric acid solution in toluene. The extract solutions were analysed using Gas Chromatography (GC) using an Electron Capture Detector (ECD) Ni^{63} . Two replicate unspiked samples, two replicate spiked samples at LOQ level and two replicate spiked samples at 10 LOQ level were analysed.

Results:

The residue data in Tables B.7.6-6 to B.7.6-9 clearly indicates that residues of Chloropicrin and Dichloronitromethane applied *via* drip irrigation or *via* soil injection were not detectable at harvest, and that residues in crops will be less than 0.005 mg/kg (i.e. $< \text{LOQ}$), when Chloropicrin is applied (one application to soil per season) at 448 kg as/ha no later than $22 (\pm 2)$ days before planting. This confirms that although Dichloronitromethane was observed in the aged column residue study in soil, it will not be translocated within the plant and will not be present in tomatoes at harvest. Therefore, Dichloronitromethane is not considered relevant and no further data is required.

Table B.7.6-6: Summary of Residue Trials in Tomato (Residues Study LN95) in Italy – Chloropicrin Analytical Results (Application by Soil Injection to Bare Soil, Pre-Planting)

Trial reference number	Year	Application rate kg as /ha	PHI	Residues found (mg/kg)	Recovery data
Stored frozen at -25°C ≤ T ≤ -10 °C First Sampling					
5-T3-424.N.SAG08S	2009	450.55	68 days	< 0.005 mg/kg (LOQ)	At 5.349 µg/kg : 84.4 – 85.2 % At 53.49 µg/kg : 81.3 – 82.5 %
Stored frozen at -25°C ≤ T ≤ -10 °C Second Sampling					
11-T3-424.N.SAG08S	2009	450.55	89 days	< 0.005 mg/kg (LOQ)	At 4.815 µg/kg : 83.9 – 88.8 % At 48.15 µg/kg : 82.7 – 86.4 %
Stored frozen at -80 °C First Sampling					
5-T3-424.N.SAG08S	2009	450.55	68 days	< 0.005 mg/kg (LOQ)	At 5.349 µg/kg : 80.7 – 84.9 % At 53.49 µg/kg : 83.7 – 83.2 %

Table B.7.6-7: Summary of Residue Trials in Tomato (Residues Study LN95) in Italy – Chloropicrin Analytical Results (Application by Drip Application to Bare Soil, Pre-Planting)

Trial reference number	Year	Application rate kg as /ha	PHI	Residues found (mg/kg)	Recovery data
Stored frozen at -25°C ≤ T ≤ -10 °C First Sampling					
3-T2 424.N.SAG08S	2009	450	68 days	< 0.005 mg/kg (LOQ)	At 5.349 µg/kg : 84.4 – 85.2 % At 53.49 µg/kg : 81.3 – 82.5 %
Stored frozen at -25°C ≤ T ≤ -10 °C Second Sampling					
9-T2 424.N.SAG08S	2009	450	89 days	< 0.005 mg/kg (LOQ)	At 4.815 µg/kg : 83.9 – 88.8 % At 48.15 µg/kg : 82.7 – 86.4 %
Stored frozen at -80 °C) First Sampling					
3-T2 424.N.SAG08S	2009	450	68 days	< 0.005 mg/kg (LOQ)	At 5.349 µg/kg : 80.7 – 84.9 % At 53.49 µg/kg : 83.7 – 83.2 %

LOQ = 0.005 mg/kg

Table B.7.6-8: Summary of Residue Trials in Tomato (Residues Study LN95) in Italy – Dichloronitromethane Analytical Results (Application by Soil Injection to Bare Soil, Pre-Planting)

Trial reference number	Year	Application rate kg as /ha	PHI	Residues found (mg/kg)	Recovery data
Stored frozen at -25°C ≤ T ≤ -10 °C Second Sampling					
11-T3-424.N.SAG08S	2009	450.55	89 days	< 0.005 mg/kg (LOQ)	At 5.74 µg/kg : 89.2 – 94.4 % At 57.40 µg/kg : 70.1 – 72.4 %
Stored frozen at -80 °C First Sampling					
5-T3-424.N.SAG08S	2009	450.55	68 days	< 0.005 mg/kg (LOQ)	At 4.986 µg/kg : 89.6 – 90.1 % At 49.86 µg/kg : 76.7 – 74.9 %

Table B.7.6-9: Summary of Residue Trials in Tomato (Residues Study LN95) in Italy – Dichloronitromethane Analytical Results (Application by Drip Application to Bare Soil, Pre-Planting)

Trial reference number	Year	Application rate kg as /ha	PHI	Residues found (mg/kg)	Recovery data
Stored frozen at -25°C ≤ T ≤ -10 °C Second Sampling					
9-T2 424.N.SAG08S	2009	450	89 days	< 0.005 mg/kg (LOQ)	At 5.74 µg/kg : 89.2 – 94.4 % At 57.40 µg/kg : 70.1 – 72.4 %
Stored frozen at -80 °C First Sampling					
3-T2 424.N.SAG08S	2009	450	68 days	< 0.005 mg/kg (LOQ)	At 4.986 µg/kg : 89.6 – 90.1 % At 49.86 µg/kg : 76.7 – 74.9 %

LOQ = 0.005 mg/kg

Conclusions:

The residue data clearly indicates that residues of Chloropicrin and Dichloronitromethane applied *via* drip irrigation or *via* soil injection were not detectable at harvest, and that residues in crops will be less than 0.005 mg/kg (i.e. < LOQ), when Chloropicrin is applied (one application to soil per season) at 448 kg as/ha no later than 22 ($\pm$ 2) days before planting. This confirms that although Dichloronitromethane was observed in the aged column residue study in soil, it will not be translocated within the plant and will not be present in tomatoes at harvest. Therefore, Dichloronitromethane is not considered relevant and no further data is required.

The study is considered acceptable.

B.7.7 Effects of industrial processing and/or household preparation (Annex IIA 6.5; Annex IIIA 8.4)

Please refer to the DAR from 2006.

B.7.8 Livestock feeding studies (Annex IIA 6.4; Annex IIIA 8.3)

It was demonstrated in the study outlined in section B.7.2, that when used as a pre-plant soil fumigant, Chloropicrin is degraded in the soil before it is metabolised by the plant into natural plant biochemical components.

According to Commission Directive 96/68/EC, livestock feeding studies are only required when significant residues ($\geq$ 0.1 mg/kg of the total diet received, except special cases e.g. active substances which accumulate) occur in crops or part of the crop (e.g. trimmings, waste) fed to animals. It is proposed that these studies are not relevant in this instance as Chloropicrin was not detected in crops at harvest, therefore no livestock feeding studies are required.

Furthermore, residue trials in tomatoes carried out in Northern and Southern Europe confirmed that the residue levels in crops are less than the limit of quantification of 0.005 mg/kg which also supports the fact that residues of Chloropicrin will not be present in crops when Chloropicrin 99 is applied according to the proposed GAP. Therefore, as residues of Chloropicrin will not exceed the trigger value of 0.1 mg/kg of the total diet received, and as tomatoes are not considered a food group which is fed to livestock, a study on metabolism, distribution and expression of residues in livestock is not considered relevant.

Comment: amounts of Chloropicrin residue < 0.1 mg/kg occur in crops therefore specific studies are unnecessary.

B.7.9 Residues in succeeding or rotational crops (Annex IIA 6.6; Annex III 8.5)

There were no detectable residues in the current crop as demonstrated in B.7.6.2 above, therefore residues in a succeeding crop would be very unlikely.

Chloropicrin is injected into the soil a minimum of three weeks prior to planting. The interval between application and planting of the primary crop in the fumigated soil is the shortest planting interval for any crop, including succeeding crops. Four trials carried out in Northern Europe and in Southern Europe have indicated that there are no detectable residues present in the soil after treatment. Studies on residues on succeeding or rotational crops are not required for several reasons. Firstly, no residues are present in the primary crop when Chloropicrin is applied to soil pre-planting and tomato crops are planted according to the proposed GAP. According to Commission Working Document 7524/VI/95 if < 10% of active substance and

bioavailable metabolites are present after 100 days, no further testing on succeeding crops is required. This is the case for Chloropicrin. Secondly, in the case where a crop might fail and a second crop is planted, Chloropicrin would not be re-applied to the soil and therefore, residues would not be present in the succeeding crop sown. Chloropicrin is applied once a year to soil pre-planting. If a crop fails and a second crop is planted Chloropicrin is not applied a second time as the soil is considered treated for 1 year following application. In addition, laboratory studies have shown that the rate of dissipation (DT_{50}) in soil for Chloropicrin ranges from 3.9 to 26.9 days depending on the soil type. The worst-case DT_{50} of Chloropicrin in soil is considered to be 26.9 days with an average DT_{50} of 9.4 days. Therefore, Chloropicrin is not considered persistent in the soil. In addition it is extremely volatile and rotivation of the soil takes place prior to planting to allow any possible residual trace of the product vapour to be released into the atmosphere. Therefore, no residues will be present in succeeding crops planted following sowing of tomato crops in soil treated with Chloropicrin and studies on succeeding crops are, therefore, not required. It is proposed that a study to determine residues in succeeding crops will not provide any new information, rendering this point not relevant to Chloropicrin.

B.7.10 Proposed pre-harvest intervals for envisaged uses, or withholding periods, in the case of post harvest uses (Annex II A 6.8; Annex IIIA 8.7).

B.7.10.1 Pre-harvest interval (in days) for each relevant crop

It is proposed that this point is not relevant to Chloropicrin as fumigation of the soil is carried out 22 ± 2 days prior to planting crops. Therefore, no pre-harvest interval for each relevant crop is required.

B.7.10.2 Re-entry period (in days) for livestock to areas to be grazed

Please refer to the DAR from 2006.

B.7.10.3 Re-entry period (in hours or days) for man to crops, buildings or treated spaces

The re-entry period for man to treated fields is the length of time for workers to begin planting crops after application (i.e. 22 ± 2 days). Professional applicators wearing relevant PPE are permitted for re-entry to treated fields on day 8 after application to remove the tarpaulin.

Response to comments from Member states:

In the case of man re-entering treated areas it is proposed that the re-entry period is the time between application and removal of the tarp i.e. 8 days.

B.7.10.4 Withholding period (in days) for animal feeding stuffs

Please refer to the DAR from 2006.

B.7.10.5 Waiting period (in days) between last application and sowing or planting the crops to be protected

The waiting period between soil injection prior to crop planting and sowing or planting of the crops to be protected is 22 ± 2 days.

B.7.10.6 Waiting period (in days) between application and handling treated product

Please refer to the DAR from 2006.

B.7.10.7 Waiting period (in days) between last application and sowing or planting succeeding crops

It is proposed that this point is not relevant to Chloropicrin. Chloropicrin is envisaged for use pre-planting with a 22 ± 2 day waiting period before planting. Chloropicrin is degraded before planting of the initial crop, therefore a waiting period between application and planting of succeeding crops should not be required.

B.7.11 Community MRLs and MRLs in EU Member States (Annex IIIA 12.2)

According to Regulation 396/2005, the “temporary” EU-MRL for Chloropicrin stated in Annex IIIA, is set at 0.05 mg/kg. However, a total of 8 new trials have been carried out and a new MRL is proposed on this basis.

B.7.12 Proposed MRLs and justification for the acceptability of those MRLs (Annex IIA 6.7; Annex IIIA 8.6)

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 has been calculated according to Method 1 and Method 2 (EU guideline Document 7039/VI/95 EN 7, 22 Jul 1997). The MRL proposed is therefore 0.01 mg/kg.

B.7.13 Proposed EU Import tolerances and justification for the acceptability of those residues

It is proposed that import tolerances are set at the proposed MRL of 0.01 mg/kg, as any raw or processed crops imported from countries outside the EU are unlikely to contain residues of Chloropicrin above the proposed MRL of 0.01 mg/kg.

B.7.14 Basis for the differences, if any, in conclusions reached having regard to established or proposed Codex MRLs

Please refer to the DAR from 2006.

B.7.15 Estimates of potential and actual dietary exposure through diet and other means (Annex IIA 6.9; Annex IIIA 8.8)

To assess the potential exposure of consumers to residues of Chloropicrin resulting from the intended uses of Chloropicrin given in Table 1 Section 1.4.3.1 (Volume 1, Level 1), an estimate of the intake of the residues was made for average consumers of tomatoes. Consumption data were based on one international diet (European Region) based on data from the World Health Organization (WHO).

The Theoretical Maximum Daily Intake (TMDI) is calculated for 27 diets including numerous national diets across Europe and the international diet (European Region) based on data from the World Health Organization (WHO). The consumer risk assessment was performed for Chloropicrin using the EFSA PRIMO-rev.2 (Pesticide Residue Intake Model). The proposed MRL of 0.01 mg/kg was used in the risk assessment.

The TMDI is calculated by multiplying the proposed MRL by the estimated average daily consumption for a given food commodity.

$$\text{TMDI} = \sum \text{MRL} \times F$$

where:

MRL = Maximum residue limit for a given food commodity, in mg of pesticide per kg of food

F = Consumption of that food commodity, as derived from the hypothetical global or national diet in kg of food per person per day

Calculation of the TMDI is a 'worst-case' estimate of risk to consumers in that it assumes that:

- All produce that may have been treated has been treated and contains residues at the EU-MRL
- There is no loss of residue during transport, storage, processing or preparation of foods prior to consumption.

Using the PRIMO rev.2 model from EFSA, taking into account direct tomato consumption, the TMDIs for Chloropicrin are less than 3,1% of the ADI.

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.

B.7.16 Summary and evaluation of residue behaviour (Annex IIA 6.10; Annex IIIA 8.9)

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.

Studies on the metabolism, distribution and expression of residue in livestock and livestock feeding studies are not required because no residues of toxicological concern were determined in plant metabolism studies. Furthermore, application of Chloropicrin to areas of pasture that will be grazed by livestock is not envisaged.

The proposed residue definition of Chloropicrin residue in plants is: Chloropicrin (parent compound) alone.

The programme of supervised field trials conducted in Italy and the UK involved pre-planting soil fumigation or drip irrigation. Considering these results, the proposed EU-MRL for Chloropicrin in tomato after pre-planting application treatment is 0.01 mg/kg.

The potential impact of Chloropicrin on succeeding crops and the effects from industrial processing need not be investigated for crops treated by Chloropicrin. Plant metabolism studies indicate that no residues of toxicological significance are formed in plant parts and specifically Chloropicrin was not detected at any point during the plant metabolism studies. Therefore, Chloropicrin is not likely to be present in plants or plant products that were planted on previously treated fields or those subjected to industrial processing.

The re-entry period for man to treated fields is the length of time for workers to begin planting crops after application (i.e. 22 ± 2 days). Professional applicators are permitted for re-entry to treated fields on day 8 after application to remove the tarpaulin.

The waiting period between soil injection prior to crop planting and sowing or planting of the crops to be protected is 22 ± 2 days.

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B.7.17 References relied on

Active substance and formulation

Annex point / reference number	Author(s)	Year	Title Source (where different from company) Company, Report No. GLP or GEP status (where relevant) Published or not	Data Protection claimed Y/N	Owner
IIA 6.1.1/01	Gandhi, J.S.G.	2009	Determination of Residues of Chloropicrin in Samples of Tomato Following One Month Freezer Storage in Compliance with Good Laboratory Practice Oxford Analytical Ltd Report No. OA01656 GLP, Unpublished	Y	European Chloropicrin Group
IIA 6.3.1/03	Couldridge, C.	2009	Residues of Chloropicrin in Outdoor Grown Tomatoes following a Single Application via Drip Irrigation or Shank Fumigation Oxford Agricultural Trials Ltd Report No. 671-08-RIV-TOM GLP, Unpublished	Y	European Chloropicrin Group
IIA 6.3.1/04	Gandhi, J.S.G	2008	Analysis of Residues of Chloropicrin in Outdoor Grown Tomatoes with Associated Validation in Compliance with Good Laboratory Practice Oxford Analytical Ltd Report No. OA01626 GLP, Unpublished	Y	European Chloropicrin Group
IIA 6.3.1/05	Zoboli, G.	2009	Residue Determinations of Chloropicrin in Tomatoes According to the OECD Principles of GLP (Good Laboratory Practice) Neutron S.r.l. Report No. LN93-08 GLP, Unpublished	Y	European Chloropicrin Group
IIA 6.3.1/06	Ferrari D.	2009	Determination of Residues of Chloropicrin and its Metabolite Dichloronitromethane in Protected Grown Tomato at Harvest Following a Single Application (Soil Drip and by Injection) of Chloropicrin 99 – One Trial in Italy – 2008 – 2009 Neutron S.r.l. Report No. LN95 GLP, Unpublished	Y	European Chloropicrin Group