



Product Safety Summary for Chloropicrin

Chemical Identity

Name:	Chloropicrin
CAS number:	76-06-2
Synonyms:	Trichloronitromethane, Technical Chloropicrin
Chemical Formula:	CCl ₃ NO ₂

Product Uses

Chloropicrin is a broad spectrum fumigant used as a pre-plant soil fumigant at agricultural sites, tree replant sites, and greenhouses for the control of various soil borne diseases, fungi, and nematodes. It functions as a pest management system that aids growers to achieve increased food production per unit of land. Crops that benefit from chloropicrin include: potatoes, fruit and nut trees, berries, melons, tomatoes, ornamentals, and tobacco. Chloropicrin is also formulated with other fumigants, such as 1,3-dichloropropene or methyl bromide, to target problematic soil borne diseases.

Chloropicrin is also used as a warning agent by adding it to odorless chemicals used for fumigation or in structures during structural fumigation. This is due to chloropicrin being readily detected at very low levels.

Physical/Chemical Properties

Pure chloropicrin is a clear, colorless, oily liquid that can become pale yellow if aged or exposed to air. Some physical and chemical properties are listed below:

PROPERTY	VALUE
Physical State	Liquid
Color	Clear, colorless
Odor	Strong, sharp, irritating (pungent)
pH	Not applicable
Specific Gravity	1.6558 at 20°C (68°F)
Boiling Temperature	112°C (233.6 °F)
Vapor Pressure	23.2 mmHg at 25°C
Vapor Density	5.7 (air=1)
Solubility in Water	Slightly in water
Flammability	Not flammable

Although chloropicrin is non-flammable, fire conditions can cause product instability and temperatures above 60°C (140°F) and should be avoided to prevent package integrity failure and rapid release of the product.

Additional physical and chemical property information is available on the Safety Data Sheet (SDS) for Technical Chloropicrin or for the formulated product.

Health Effects

Chloropicrin vapors cause eye, nose, throat, and upper respiratory irritation with eye irritation being the most sensitive effect. Chloropicrin is known as a strong tear producing eye irritant (lachrymator), which is its most predominant exposure effect. Inhalation is the most noteworthy route of exposure and causes marked irritation to the upper respiratory tract at low concentrations. Inhalation of higher concentrations can be fatal. Direct skin contact with liquid chloropicrin can cause severe irritation or chemical burn. Ingestion of the product is harmful and can be fatal.

No studies or anecdotal information are available which describe toxic effects to humans from chronic exposure to chloropicrin. However, nasal rhinitis and widening of the bronchioles have been observed in mice subjected to 1 ppm over a 2 year period.

Additional data on health effects can be found on the product SDS.

Environmental Effects

Chloropicrin does not accumulate in soil or water due to rapid evaporation and degradation. Similarly, the volatility and degradation of chloropicrin limits the likelihood of exposure to fish and wildlife. Studies of chloropicrin have shown that it is toxic to humans, animals, aquatic life, fungus, and nematodes. Professionals using chloropicrin must use caution to avoid inadvertent discharges into lakes, streams, ponds, estuaries, oceans and other waterways.

Environmental Fate:

The fate of chloropicrin in soil, water, and air has been studied. The chart below summarizes the outcomes of the studies:

Soil	Rapidly volatilizes and therefore does not accumulate. In soil, chloropicrin degrades with half-lives ranging from 3.7 to 4.5 days with carbon dioxide, nitrate, and chloride being the terminal breakdown products.
Water	Readily volatilizes and will photodegrade in surface layers of water (half-life approximately 3 days).
Air	Will photodegrade into breakdown products (half-life 20 days).
Bioaccumulation	Low bioaccumulative potential (<5.0), so not expected to bioaccumulate in aquatic organisms.
Ozone	Not recognized as a threat to the ozone layer.

Aquatic/Terrestrial Toxicity:

Based on limited data, chloropicrin is considered highly toxic to both fish and aquatic invertebrates. Chloropicrin is also considered highly toxic to mammals.

Food Residue:

There are no food tolerances for chloropicrin since the US EPA does not anticipate chloropicrin residue on food based on its volatility and results from metabolism studies on soil and plants.

For more data, see product SDS.

Potential Exposure

Potential for exposure to chloropicrin can occur during manufacturing, transportation, and use.

In regards to the potential for accidental release at any point in the life cycle of the product, chloropicrin has excellent warning properties at very low concentrations due to its highly irritating effect on the eyes and upper respiratory system. Early sensation of these irritating effects enables a person to either quickly take protective action to minimize exposure to the vapors or prevents a person from choosing to stay in dangerous concentration situations.

Occupational Exposure:

Chloropicrin is manufactured, reformulated, and repackaged in closed systems. Therefore, occupational exposure to chloropicrin is not expected during normal operating conditions. During certain tasks where there is a potential for exposure (e.g., maintenance, cleaning, sampling, testing or upset conditions), personal protective equipment (PPE) is required and written procedures are followed.

Transportation Exposure:

Accidental release of chloropicrin liquid or vapor could occur during transportation of the product due to vehicle collision or while loading or unloading product packages. Transport requirements for chloropicrin are strict and require high performance packaging to be used (Packing Group I). Transporters of chloropicrin and their drivers are subject to high standards of performance by regulations. Adherence to written procedures ensures proper closure of all packaging types used for chloropicrin.

Agricultural Exposure:

The main risk of concern for handlers, workers, and bystanders associated with the soil uses of chloropicrin is from acute inhalation exposure as a result of fumigant off-gassing.

Chloropicrin fumigant products are “restricted use pesticides,” meaning only professional applicators who are licensed/certified can buy and use them. Certified applicators must

successfully complete general pesticide training, general fumigant training, and a specific chloropicrin fumigant course developed by chloropicrin manufacturers and approved by the US EPA.

Agricultural workers who could be exposed to chloropicrin during application are required to wear appropriate personal protective equipment and follow detailed label instructions to reduce risk of exposure.

Public or Consumer Exposure:

The main risk of concern is acute inhalation exposure to bystanders due to off-gassing after chloropicrin or its formulated products have been used to fumigate agricultural soil. Buffer zones and proper postings are required by the US EPA to protect by-standers and the public during field application. Chloropicrin can also be used as a warning agent for structural fumigation with sulfuryl fluoride.

Consumers are not expected to be exposed to chloropicrin because it is not available for home use.

Environmental Exposure:

Unintended release into the environment may occur during the manufacture, storage, transport, or application of chloropicrin. Testing shows that exposure is not expected in drinking water or in residues from crops harvested from soil treated with chloropicrin. Chronic exposure to chloropicrin from treatment of individual fields is not expected. There is no US EPA data available regarding avian inhalation or terrestrial exposure effects.

Manufacturing and agricultural personnel are trained to respond to leaks or spills including implementation of evacuation zones and use of emergency personal protective equipment and procedures.

More information on prevention and mitigation of potential exposures is available in the product SDS.

Risk Management

Risk management of chloropicrin is focused on its acute health effects, equipment and packaging integrity, and proper end use. Effective risk management measures are summarized below:

Manufacturing or Industrial Sites:

Chloropicrin is a respiratory irritant and poses additional hazards to the skin and eyes. Work areas are well ventilated to maintain concentrations below exposure limits. If exposures exceed accepted limits or eye or respiratory discomfort occurs, a full face NIOSH-approved air

purifying respirator with organic vapor cartridges or a self-contained breathing apparatus may be acceptable.

Eyewash fountains and safety showers should be located in strategic areas where chloropicrin is handled. Respiratory protection must be available for first responders assisting a person exposed to liquid product.

Chloropicrin can react with certain materials of construction. Chloropicrin degrades PVC, dissolves rubber compounds and fiberglass resin, and is mildly corrosive to carbon steel in the presence of moisture. Optimal materials of construction have been identified and are utilized to ensure long term performance and integrity during product manufacturing. Refer to the product SDS for more information on incompatible materials.

Water contamination can lead to generation of corrosive constituents over time that can affect the integrity of equipment and packaging containing chloropicrin. To minimize the presence of moisture in chloropicrin, only dry air or nitrogen is utilized in its storage and handling. Containers are kept closed at all times, even when empty, to prevent the introduction of moist air.

Personnel involved in chloropicrin manufacturing, reformulating, and repackaging are trained in the technical and operational aspects of these activities.

Agricultural Sites:

Significant training is required for applicators, handlers and workers who use fumigants such as chloropicrin. The product end use label contains detailed directions for the application method and contains specific requirements for PPE and when to conduct air sampling. Strictly following the end use label is required to manage recognized risks.

Prior to performing agricultural applications, a written Fumigant Management Plan (FMP) must be developed and followed. The FMP is specifically customized for the application location and the application method to be used and addresses required mitigation activities that must be followed or performed before, during, and after the application. For example, buffer zones are established between the fields being fumigated and the nearby population, while posting around the field perimeter provides warning and other information to by-standers.

Product Stewardship

As a registered pesticide, chloropicrin is sold only to certified/licensed professionals and growers. Trinity Manufacturing provides high quality chloropicrin in DOT-compliant shipping containers.

The production and sale of chloropicrin requires strict regulatory controls and documentation. In the U.S., training is required prior to purchase of chloropicrin or its formulated products, and a fumigation applicator or user is required to obtain a state fumigation license. In addition to implementing training programs, technical service and emergency response are available for

chloropicrin as needed. In addition, the Trinity Manufacturing web site provides access to the chloropicrin label, SDS, and Product Safety Summary.

See the product SDS for additional information about first aid measures, accidental releases (spills and leaks), waste disposal, toxicity, transportation, regulatory requirements and other important topics.

Additional technical assistance regarding physical properties and specific information for storing, unloading, and using chloropicrin, can be requested from Trinity Manufacturing, Inc. See contact information below.

Regulatory Information

Regulations exist that govern the manufacture, transportation, pesticide usage and/or disposal of chloropicrin. These regulations vary by city, state, country or geographic region. Information may be found by consulting the product SDS.

Additional information about chloropicrin can be found at these websites:

<http://www.trinitymfg.com/home/trinity-home.php>

<http://www2.epa.gov/soil-fumigants/soil-fumigant-training-certified-applicators>

<http://www.fumeinfo.org>

<http://pmep.cce.cornell.edu/>

<http://toxnet.nlm.nih.gov/>

<http://www.cdc.gov/niosh/>

<http://www.inchem.org/documents/icsc/icsc/eics0750.htm>

Contact Information

For additional information, call Trinity Customer Service at (800) 632-6228 or (910) 419-6551.

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This Product Safety Summary is intended to provide a general overview of the chemical substance. The information on the Summary is basic information and is not intended to provide emergency response information, medical information, or treatment information. For in-depth safety and health information, refer to the product's Safety Data Sheet (SDS), the product's label, and other safe use and handling literature for the chemical substance.