

Pesticide Toxicity Profile: Hydrocarbon Fumigants¹

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This document provides a general overview of human toxicity, provides a listing of laboratory animal and wildlife toxicities and a cross reference of chemical, common and trade names of hydrocarbon fumigants registered for use in Florida.

General

The hydrocarbon fumigants have been used for many years throughout the United States. This chemical family of fumigants consists of four members – chloropicrin, 1,3-dichloropropene, methyl bromide, and paradichlorobenzene. As a fumigant group, they are some of the most important pest control tools used in the world. In Florida, chloropicrin, 1,3-dichloropropene, and methyl bromide are extremely effective in controlling vegetable, citrus, field crop and ornamental plant diseases, insects, and nematodes. They are non-selective pressurized gases or liquids which change into the gaseous phase. Their function relies on their remarkable capacities for diffusion, providing a thorough pest kill. Because of 1,3-dichloropropene's and methyl bromide's high acute toxicity or carcinogenic effects, they are

classified as restricted use pesticides. Chloropicrin is classified as restricted use based solely on its acute toxicity; studies have concluded that it is not considered to be a carcinogen. Methyl bromide is an odorless, colorless gas that has been used as an agricultural soil and structural fumigant since the 1940s. However, at the time of this publication, the amount of methyl bromide produced and imported in the U.S. has been incrementally reduced in a phase-out. The only uses allowed are those deemed as “critical uses.” This exemption allows methyl bromide use for purposes where no viable pest control alternatives exist. The phase-out falls under the Clean Air Act because methyl bromide has been identified by the EPA as a Class 1 ozone-depleting substance. Methyl bromide products are labeled DANGER. Many methyl bromide formulated products also contain chloropicrin. In agricultural applications, methyl bromide is injected into the soil and immediately covered with tarps which must remain in place for at least 48 hours for effectiveness. 1,3-dichloropropene is a colorless liquid which may be soil- or tarp-sealed following application, with some product labels requiring tarp-sealing for up to 14 days following treatment. Like methyl bromide

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The use of trade names in this publication is solely for the purpose of providing specific information. UF/IFAS does not guarantee or warranty the products named, and references to them in this publication does not signify our approval to the exclusion of other products of suitable composition. Use pesticides safely. Read and follow directions on the manufacturer's label.

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products, many 1,3-dichloropropene products also contain chloropicrin. Chloropicrin is a pressurized gas that has uses besides agricultural and structural, such as treatment of wood products for control of decay organisms and wood borers. Products containing chloropicrin are classified as restricted use due to acute toxicity and bear the signal word, DANGER. Paradichlorobenzene products are crystalline formulations used as moth repellents in areas where clothes and fabrics are stored; they are also sold as air fresheners and deodorizers and have activity as retardants of mold and mildew.

Toxicity

Chloropicrin is severely irritating to the upper respiratory tract, eyes, and skin. Inhalation sometimes leads to vomiting. Ingestion could be expected to cause inflammation of the stomach and intestines due to the chemical's corrosiveness. In cases where the air concentration level of chloropicrin is at least 0.1 ppm, a respirator will be required for applicators and handlers. Liver, kidney, and cardiac toxicity are seen in laboratory animals, but there are limited data available for 1,3-dichloropropene. It appears that risk of such toxicity is relatively low for humans except via ingestion of large quantities. Similar irritating effects are seen as those associated with chloropicrin. Methyl bromide is severely irritating to the lower respiratory tract and can cause fluid accumulation in the lungs, hemorrhage, or pneumonia. The onset of these respiratory problems may be delayed 4 to 12 hours after exposure. Methyl bromide is considered a central nervous system depressant, but may also cause convulsions. Early symptoms of acute poisoning include headache, dizziness, nausea, vomiting, tremor, slurred speech, and failure of muscle coordination. If liquid methyl bromide contacts the skin, severe burning, itching, and blister formation occur. Approximately 1,000 human exposure incidents caused by methyl bromide have been reported, most as a result of inhalation. There are currently few toxicity concerns associated with paradichlorobenzene-containing products, many used within the home. Its vapor is only mildly irritating to the nose and eyes. Although accidental ingestions, especially by children, have been fairly common, symptomatic human poisonings have been rare. Other

isomers of dichlorobenzene are more toxic than the isomer found in these products. Ecologically, the main concern is with chloropicrin's toxic effects on fish. Labels will carry statements expressing this concern in the Environmental Hazards section. Mammalian toxicities for the hydrocarbon fumigants are shown in Table 1. Table 2 lists the toxicities to wildlife, if known, by the common name of the pesticide. Table 3 provides a cross listing of some of the trade names that these products are registered and sold by in Florida.

Additional Information

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Table 1. Hydrocarbon fumigant mammalian toxicities (mg/kg of body weight).

Common name	Rat oral LD ₅₀	Inhalation LC ₅₀
Chloropicrin	250	150 (rabbit)
1,3-dichloropropene	127 (DD-92®)	904 (rat, Telone®)
Iodomethane	82 – 151	618 ppm (rat)
Methyl bromide	100	302 (rat, LC ₁₀₀)
Paradichlorobenzene	---	---

Table 2. Hydrocarbon fumigant wildlife toxicity ranges.

Common name	Bird acute oral LD ₅₀ (mg/kg)*	Fish (ppm)**	Bee [†]
Chloropicrin	---	HT	PNT
1,3-dichloropropene	---	---	---
Iodomethane	57	MT	---
Methyl bromide	---	---	PNT
Paradichlorobenzene	ST	MT	---

*Bird LD₅₀: Practically nontoxic (PNT) = >2,000; slightly toxic (ST) = 501 – 2,000; moderately toxic (MT) = 51 – 500; highly toxic (HT) = 10 – 50; very highly toxic (VHT) = <10.

**Fish LC₅₀: PNT = >100; ST = 10 – 100; MT = 1 – 10; HT = 0.1 – 1; VHT = <0.1.

[†]Bee: HT = highly toxic (kills upon contact as well as residues); MT = moderately toxic (kills if applied over bees); PNT = relatively nontoxic (relatively few precautions necessary).

Table 3. Cross reference list of common, trade and chemical names of hydrocarbon fumigants.

Common name	Trade names*	Chemical name
Chloropicrin	Chlor-O-Pic®, Chloropicrin®, Timber Fume®	Trichloronitromethane
1,3-dichloropropene	Curfew®, Telone®, Tri-Lone®	1,3-dichloropropene
Iodomethane	Midas®	Iodomethane
Methyl bromide	Metabrom®, Meth-O-Gas®, Methyl Bromide®	Bromomethane
Paradichlorobenzene	Many home products	1,4-dichlorobenzene

*Does not include manufacturer's prepackaged mixtures.