PI-62

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Pesticide Toxicity Profile: Thiocarbamate Fungicides[1]

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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 thiocarbamate pesticides used as fungicides registered for use in Florida.

General

As a chemical family, the thiocarbamates are a group of pesticides with a wide range of uses. Some are used as fungicides, while others have herbicidal activity. Thiocarbamate fungicides are applied for a wide variety of uses including protection of seeds, seedlings, ornamentals, turfgrass, vegetables, and fruit. They have been known as the "old reliables," as they have been in use since the 1930s and 40s. Unlike the carbamate insecticides (UF/IFAS EDIS Document PI-51 [http://edis.ifas.ufl.edu/PI088]), the thiocarbamate fungicides have very little insecticidal properties. Members of this chemical family include ferbam, metam-sodium, thiram, and ziram. Ferbam and ziram are used widely on fruit and nut trees, vegetables and tobacco. Thiram is used as a seed protectant and for certain fungus diseases of peaches, strawberries, and tomatoes. As a turfgrass fungicide, it is applied for control of brown patch and dollar spot. It also has animal repellant properties to protect fruit trees and ornamentals from damage by rabbits, rodents, and deer. Metam-sodium is applied as a soil biocide and fumigant to kill fungi, bacteria, weed seeds, nematodes, and insects. Homeowner uses of metam-sodium in the United States have been cancelled. One of its trade products has a Federal restricted-use classification for the control of tree roots in sewage and waste water systems. Product formulations of the thiocarbamate fungicides include aqueous solutions, wettable powders, dusts, flowables, water dispersible granules, emulsifiable concentrates, and granules.

Toxicity

Dust from ferbam and ziram is irritating to the skin, respiratory tract, and eyes. Prolonged inhalation of ziram is reported to have caused neural and visual disturbances. Thiram is a common component of latex and possibly responsible for some of the allergies attributed to latex. Contact dermatitis has occurred in occupationally exposed workers. Systemic human poisonings by thiram itself have been rare, probably due to limited absorption.

1. This document is PI-62, one of a series of the Pesticide Information Office, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date September 2005. Visit the EDIS Web Site at http://edis.ifas.ufl.edu.

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Metam-sodium can be very irritating to the skin, like most fumigants in general. Because of its extreme irritation of the lungs, it must be used in outdoor settings, and stringent precautions must be taken to avoid inhalation of evolved gas. Mammalian toxicities for the thiocarbamate fungicides are shown in Table 1. Table 2 lists the toxicities to wildlife by the common name of the pesticide. Table 3 provides a cross listing of many of the trade names that these products are registered and sold by in Florida.

Additional Information

Crop Protection Handbook. 2005. vol. 91. Willoughby, Ohio: Meister Publishing Co. http://www.meisterpro.com/mpn.

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Table 1. Thiocarbamate fungicide mammalian toxicities (mg/kg of body weight).

Common name	Rat oral LD_{50}	Rabbit dermal LD_{50}
Ferbam	>17,000	---
Metam-sodium	1,891	>3,074
Thiram	1,000	>5,000
Ziram	1,400	>6,000

Table 2. Thiocarbamate fungicide wildlife toxicity ranges.

Common name	Bird acute oral LD_{50} (mg/kg)*	Fish (ppm)**	Bee†
Ferbam	---	MT	PNT
Metam-sodium	MT	HT	PNT
Thiram	ST	HT	PNT
Ziram	---	MT	PNT

*Bird LD_{50}: 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 LC_{50}: 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 thiocarbamate fungicides.

Common name	Trade names*	Chemical name
Ferbam	Ferbam®	Ferric dimethyldithiocarbamate
Metam-sodium	Metam®, Vapam®	Sodium N-methyldithiocarbamate
Thiram	Aules®, Thiram®	Bis(dimethylthiocarbamoyl) disulfide
Ziram	Ziram®, Vancide®	Zinc bis(dimethyldithiocarbamate)

*Does not include manufacturers prepackaged mixtures.