

## **Pesticide Toxicity Profile: Arsenical Herbicides<sup>1</sup>**

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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 the arsenical herbicides registered for use in Florida.

### **General**

The arsenical herbicides are a group of older herbicides, having been in use since the 1950s. There are currently three arsenical herbicide active ingredients registered for use in Florida: cacodylic acid, disodium methanearsonate, and monosodium methanearsonate (DSMA and MSMA, respectively). Many arsenic compounds have been discontinued in the United States because of regulatory reasons. They are applied as postemergence or directed sprays acting primarily as contact materials with limited translocation. Their mode of action is to inhibit plant growth by uncoupling phosphorylation. Their initial plant injury symptoms are chlorosis caused by a loss of chlorophyll. Their phytotoxic activities are inactivated upon soil contact. They have been historically useful for grass control in turfgrass sites, cotton, citrus, rights-of-way, and other industrial and

non-crop sites. Commercial products are readily available and numerous. They are formulated as liquids.

The EPA has reached an agreement in principle with the major manufacturers of the organic arsenicals MSMA, DSMA, and cacodylic acid. This voluntary agreement steadily removes all organic arsenical pesticide uses, except the use of MSMA on cotton, from the market and implements new restrictions to better protect drinking water resources. Phasing out these uses is expected to accelerate the transition to new, lower risk herbicides.

### **Toxicity**

The arsenical active ingredients remaining on the market in the U.S. are the organic methylated compounds which are considered to present less toxic hazard than other forms (arsines or arsenites). Acute poisoning symptoms and signs usually appear within one hour, if ingested. Cacodylic acid is absorbed into the bloodstream more readily through inhalation than through ingestion or dermal exposure. With severe cases, garlicky odor of the breath and feces are noticeable. There may also be a salty, metallic taste in

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1. This document is PI-89, 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 November 2005. Revised May 2011. Visit the EDIS website at <http://edis.ifas.ufl.edu>.

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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 do 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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the mouth, along with abdominal discomfort. The central nervous system is also commonly affected with acute exposures, beginning with dizziness, headache, drowsiness, and confusion. Symptoms may progress with weakened muscles, spasms, coma, and convulsions. Death usually occurs one to three days following onset of symptoms and is often the result of circulatory failure, but renal injury may also contribute. Chronic exposures are more difficult to determine; but, neurological symptoms are usually more common than gastrointestinal effects which are more closely associated with acute poisoning. A sign of exposure is the formation of white bands across the nails. Mammalian toxicities for the arsenical herbicides 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**

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**Table 1.** Arsenical herbicide mammalian toxicities (mg/kg of body weight).

Common name	Rat oral LD <sub>50</sub>	Rabbit dermal LD <sub>50</sub>
Cacodylic acid (sodium salt)	2,756	---
DSMA	600	236 - 325
MSMA	1,700	>2,500

**Table 2.** Arsenical herbicide wildlife toxicity ranges.

Common name	Bird acute oral LD <sub>50</sub> (mg/kg)*	Fish (ppm)**	Bee <sup>†</sup>
Cacodylic acid (sodium salt)	PNT	ST – PNT	PNT
DSMA	ST	PNT	PNT
MSMA	PNT	PNT	PNT

\* Bird LD<sub>50</sub>: 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<sub>50</sub>: PNT = >100; ST = 10 – 100; MT = 1 – 10; HT = 0.1 – 1; VHT = <0.1.

<sup>†</sup>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 arsenical herbicides.

Common name	Trade names*	Chemical name
Cacodylic acid (sodium salt)	Liquid Edger®	Hydroxydimethylarsine oxide
DSMA	Bonide®	Disodium methanearsonate
MSMA	Ansar®, Bueno®, MSMA, others	Monosodium methanearsonate

\* Does not include manufacturers' prepackaged mixtures.