

## TOXICITIES OF SOME COMMONLY USED PESTICIDES COMPARED TO A FEW HOUSEHOLD CHEMICALS

I often receive comments and questions regarding the toxicities of the products that are commonly used to control insect pests in and around residential structures. People frequently ask me “Will the things you are using hurt my pets?” Sometimes they also ask about possible harm to their children, but mostly they seem concerned about their pets. Sometimes I am also asked if the products are “organic.” Here are a few comments on these subjects.

To begin, let's talk about a few terms, without going into detailed chemistry.

- **Organic:** a compound having a molecular structure containing carbon; an example is nicotine (chemical formula:  $C_{10}H_{14}N_2$ ).
- **Inorganic:** not having carbon in its molecular structure, for example, diatomaceous earth is mostly silica dioxide ( $SiO_2$ ); therefore it is inorganic. (Information and warnings about diatomaceous earth- [see below](#)).
- **Natural:** not synthetic, i.e., not man-made. Diatomaceous earth, although sometimes processed, can be considered as a naturally occurring substance because it consists of the exoskeletons of marine diatoms. (If some natural product is highly processed, should it still be called natural? I don't think so.)
- **Chemical:** any material substance, for example, water, salt, etc.
- **Toxic:** poisonous. A substance that is not usually considered poisonous, if administered in excess, usually becomes toxic. A list of comparative toxicities is provided below, including the toxicities of water and oxygen (see box at end).

["All substances are poisons; there is none which is not a poison. The right dose differentiates a poison from a remedy." - Paracelsus \(1493 to 1541\)](#)


- **Insecticide:** a substance that is *toxic* to insects. It may be, and usually is, toxic to other organisms as well. An insecticide can be *natural*, such as nicotine (which is very toxic) or pyrethrum (not very toxic); *synthetic*, such as permethrin, a synthetic pyrethrum; *organic*, such as DDT (yes, DDT is a chlorinated hydrocarbon, therefore organic, and happily not being sold in the USA any more); *inorganic*, such as arsenic, which I wish no one was still using, but I have read comments from people that are still using it!
- **Organic gardening:** well, this term doesn't fit with the above definitions too well unless defined something like this: the activity of growing plants exclusively using compounds containing carbon. The general definition (my understanding anyway) is: growing plants without using man-made products. The main idea that organic gardeners seem to have is that man-made products will harm people, animals, the environment, etc. Personally, I think that **each product that we might wish to use should be considered individually.**

I made the following list to show comparative toxicities of some common products. I usually look at the toxicities of acute oral exposure to rats, and these are expressed as "**LD<sub>50</sub>'s**" or the lethal median dose of a product, expressed in milligrams (mg) of the product to kilograms (kg) of weight of the exposed animal, therefore, **THE LOWER THE NUMBER, THE MORE TOXIC THE SUBSTANCE**, and higher numbers are less toxic products. This number says how many milligrams of the product per kilogram of body weight actually killed 50% of the animals (rats) tested. Important note: the LD<sub>50</sub> numbers in the list below are for the products at 100% concentration, unless otherwise indicated. In most cases, you will be using products with much lower concentrations. The lower the concentration, the less toxic the product. Example, TimBor (a borate) has an LD<sub>50</sub> of about 2,500 mg/kg of body weight for a 98% pure product. BUT for an ant bait, for example, that has 5% TimBor, then the LD<sub>50</sub> is about 50,000 mg/kg. Inferring from the LD<sub>50</sub> data, a person weighing 100 pounds would need to eat about 11 pounds of the stuff to get a toxic dose. I doubt the person would be able to eat that much.

**ADDITION** (July 2006): I am adding the LD<sub>50</sub> values for a few venoms of stinging insects. This should make it apparent that venoms, which are natural products, are far more toxic (i.e., dangerous) than many commonly used insecticides. To put it another way, if I had a small baby in the house, I would rather use some not-very-toxic insecticide rather than allowing red imported fire ants to crawl all over the place and sting the baby. People die every year from insect stings! Fire ant stings are FAR more toxic than most insecticides. (See: <http://ufbir.ifas.ufl.edu/Chap23.htm>)



## TOXICITY OF SOME MATERIALS

Material	Acute Oral LD <sub>50</sub> (rat) in mg/kg (see above)	
Harvester ant venom	0.66 EXTREMELY TOXIC (but "organic")	<div style="color: red; font-weight: bold; font-size: 1.2em;">MORE TOXIC</div> 
Paper wasp venom	2.4	
Honey bee venom	2.8	
Yellow jacket venom	3.5	
Nicotine	10	
Toxaphene	29	
Gasoline	50	
Fipronil	95 (see Termidor below)	
Diazinon®	100	
Caffeine	200	
Pyrethrums	200 to 2,600 (more below)	
Sevin®	650	
Aspirin	1,200	
Malathion®	1,375	
Household bleach	2,000	
TimBor®	2,500 and at 5% is 50,000	
Borax	2,500	
<b>Table Salt</b> -----	<b>3,320</b> -----	
Boric Acid	3,500	
Baking Soda	4,200	
DeltaDust	5,050	
<i>d</i> -Limonene (the active ingredient in orange oil)	5,300	
Grain Alcohol	14,000	
Termidor® (as 0.06% Fipronil spray, so the LD50 would be about 15,800)		
Sugar	30,000	
Niban®	60,000+	

LESS TOXIC

The idea that I am trying to convey, is that a substance can be called *organic*, *inorganic*, *synthetic*, *natural* or whatever, but you need to really look at what the substance *is* before deciding that it is "safe" or "dangerous". Saying that something is *natural* or *organic* doesn't necessarily mean it is safe for you, or for the environment; for example, nicotine, is *organic* and *natural*, but is also *highly toxic*. And because something is *inorganic*, it is not necessarily dangerous, for example, borax (disodium tetraborate decahydrate  $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ ) is relatively very safe.

### **Toxicity of Water and Oxygen**

“Even chemicals that are necessary for life such as water and oxygen can be toxic. Human experience has shown that while usual amounts of oxygen and water don't cause adverse effects in humans, higher amounts can. Drinking very large amounts of water in a short period of time can lead to swelling and brain damage, particularly in infants. Breathing pure oxygen can also cause problems in humans, in this case irritation of the lungs. Thus, toxicity assessment is not about determining what is toxic, but rather about how much of a chemical causes what kind of harm.”

From: [http://www.iet.msu.edu/Tox\\_for\\_Journ/journtoxicityassessment.htm](http://www.iet.msu.edu/Tox_for_Journ/journtoxicityassessment.htm)

more on the toxicity of water:

<http://chemistry.about.com/cs/5/f/blwaterintox.htm>

For further information on these products, you can do a Google search. You will find some variation in the LD<sub>50</sub> numbers that you find, and this is because each laboratory calculates the toxicities under slightly different conditions. Comments are welcome.

Dr. John Warner, Ph.D. Entomology  
[whitefootedant@gmail.com](mailto:whitefootedant@gmail.com)

Toxicity information from various sources, including:

<http://edis.ifas.ufl.edu/PI008>

<http://extoxnet.orst.edu/>

<http://pmep.cce.cornell.edu/facts-slides-self/core-tutorial/module04/>

<http://entweb.clemson.edu/pesticide/Document/toxicity.htm>

<http://www.cmmcp.org/toxicity.pdf>

<http://www.bugwood.org/PAT/03ToxicologyGeneral.html>

Learn about the dangers of **DIHYDROGEN MONOXIDE!**

<http://www.dhmo.org/facts.html>

...information about **Diatomaceous earth:**

## **Diatomaceous earth**

Selections from:

[http://www.cpchem.com/enu/msds\\_unsecured/Import\\_25550\\_MSDS\\_O\\_ENGLISH\\_A\\_ENGLISH\\_A\\_N.pdf](http://www.cpchem.com/enu/msds_unsecured/Import_25550_MSDS_O_ENGLISH_A_ENGLISH_A_N.pdf)

### **Personal Protection Information**

**Ventilation:** Use adequate ventilation to control below recommended exposure levels.

**Respiratory Protection:** For concentrations exceeding the recommended exposure level, use NIOSH/MSHA approved respirator for protection against dust and mists having an exposure limit measured as a time-weighted average of not less than 0.05 mg/m<sup>3</sup>.

**Eye Protection:** Not generally required.

**Skin Protection:** Protective gloves for prolonged exposures.

NOTE: Personal protection information shown in Section C is based upon general information as to normal uses and conditions. Where special or unusual uses or conditions exist, it is suggested that the expert assistance of an industrial hygienist or other qualified professional be sought.

### **Handling and Storage Precautions**

Do not get in eyes, on skin or on clothing. Do not breathe vapors, mist, fume or dust. Wash thoroughly after handling. Launder contaminated clothing before reuse. Wear protective equipment and/or garments described in Section C if exposure conditions warrant. Use only with adequate ventilation.

Store in a dry area in sealed containers or bags. Store in a closed container. Store in a well-ventilated area.

### **Health Hazard Data**

#### **Acute Effects of Overexposure:**

**Eye:** May cause **severe mechanical irritation** if in eyes for prolonged period of time.

**Skin:** May cause irritation from mechanical friction.

**Inhalation:** May cause drying and irritation of the mucous membranes of the nose, throat and upper respiratory tract.

**Ingestion:** May cause irritation to the gastrointestinal tract.

### **Subchronic and Chronic Effects of Overexposure:**

High dust concentrations of diatomaceous earth over an extended number of years may produce pneumoconiosis (inflammation of the lungs). Crystalline silica has been classified as **probably carcinogenic** for humans (2A) by the International Agency for Research on Cancer (IARC).

Inhalation of aluminum oxide particles has been associated with a condition (Shaver's disease), characterized by **pulmonary fibrosis** and **emphysema**. However, exposures may not have been limited to aluminum oxide alone.

Chronic inhalation of dust containing crystalline silica may cause silicosis, a progressive pulmonary fibrosis which may be associated with significantly impaired pulmonary function, cardiopulmonary impairment, and **death**. Symptoms may progress after dust exposure ceases. Silicosis typically results from silica dust exposure over many years.

### **First Aid and Emergency Procedures:**

**Eye:** Flush eyes with running water for at least fifteen minutes. If irritation or adverse symptoms develop, seek medical attention.

**Skin:** Wash skin with soap and water for at least fifteen minutes. If irritation or adverse symptoms develop, seek medical attention.

**Inhalation:** Immediately remove from exposure. If breathing is difficult, give oxygen. If breathing ceases, administer artificial respiration followed by oxygen. Seek immediate medical attention.

**Ingestion:** Give two glasses of water and induce vomiting, only if subject is conscious. Seek medical attention.

Did you think diatomaceous earth was safe and organic?  
Suggestion: always read the label!

#### **Pyrethrum information**

Click here: <http://extoxnet.orst.edu/pips/pyrethri.htm>

**Shalom Pest Control** now offers an *Organic Pest Control Service*. This service uses products that are USDA NOP (National Organic Program) compliant.

Shalom Pest Control makes no claims or guarantees about these products as to their safety or effectiveness.