



This is a section from the

2018

Mid-Atlantic

Commercial Vegetable

Production Recommendations

The manual, which is published annually, is **NOT** for home gardener use.

The **full manual**, containing recommendations specific to New Jersey, can be found on the Rutgers NJAES website in the Publications section:

<http://njaes.rutgers.edu/pubs/publication.asp?pid=E001>.

The **label** is a legally-binding contract between the user and the manufacturer. The user must follow all rates and restrictions as per label directions. The use of any pesticide inconsistent with the label directions is a violation of Federal law.

Cooperating Agencies: Rutgers, The State University of New Jersey, U.S. Department of Agriculture, and County Boards of Chosen Freeholders. Rutgers Cooperative Extension, a unit of the Rutgers New Jersey Agricultural Experiment Station, is an equal opportunity program provider and employer.

D. Pesticide Safety

1. General Information

Laws and Regulations

Be sure to check current state and federal laws and regulations regarding the proper use, storage, and disposal of pesticides before applying these chemicals. For restricted-use pesticides, an applicator is required to be certified or work under the direct supervision of a certified individual. **For information on the requirements for certification of pesticide applicators, contact your state pesticide regulatory agency or Cooperative Extension agent.**

Certification Pesticide Applicators

The Federal Insecticide, Fungicide, and Rodenticide Act of 1972 (FIFRA) required each state to set up a program to certify users of pesticides. This certification is designed to show that users of pesticides know how to use pesticides safely in order that they do not endanger the user, his co-workers or the environment. Certified users of pesticides are classified as either private applicators or commercial applicators. The certification process is somewhat different for each group. **The definitions of private and commercial applicators are as follows:**

Private Applicator. Any person who uses, or supervises the use of, pesticides for the purpose of raising some type of agricultural commodity. The application can be done on land owned or rented by the applicator or the applicator's employer. However, any applications done on a "for-hire" basis are considered commercial applications. Examples of private applicators are dairy farmers, vegetable or fruit growers, greenhouse growers, and ranchers that apply pesticides only within their own confines. Private applicators who purchase and apply restricted-use pesticides must be certified and registered. In New Jersey, private applicators must be certified and licensed to apply any pesticide, including organic and general use pesticides.

Commercial Applicator. Any person who uses, or supervises the use of, pesticides on a "for-hire" basis; any person who applies pesticides for nonagricultural purposes; any person who applies pesticides as a part of his job with any governmental agency. Examples of commercial applicators are: exterminators; landscapers; tree services; crop dusters; weed control firms; and owners of apartments, motels, nursing homes, restaurants, etc., who do their own pest control work. Commercial applicators must be certified and licensed to use **any** pesticide in New Jersey, including organic and general use pesticides.

Commercial Pesticide Operator Licensing (New Jersey). Anyone applying pesticides under direct supervision of a commercial licensed pesticide applicator must be licensed as a pesticide operator unless the certified applicator is always physically present when the uncertified individual is handling pesticides.

2. Handling Pesticides

2.1 Introduction

Before opening a pesticide container, applicators should **read the label carefully**, and accurately follow all directions and precautions specified by the label. Using a pesticide for any other uses or in any other manner than what is on the label information is against the law. Determine in advance the proper safety equipment, protective clothing and measuring equipment you will need for the pesticide task that you will be performing. The protective equipment necessary may include socks, shoes, long pants, long-sleeve shirt, and a hat. Additional safety equipment may also be required by the label. Consult the Precautionary Statements of pesticide label for the minimum Personal Protection Equipment (PPE) required by law. See the protective equipment paragraphs later in this section for more detail. Your physician should be advised of the types of pesticides you use in your work and if you will be using a respirator. Before the start of the spray season, each applicator should have a blood cholinesterase level determined. Every 4 to 6 weeks during the spray season, the level of blood cholinesterase should be reevaluated.

When applying pesticides, be sure to have a supply of clean water and liquid detergent available for drenching and washing in case of an accident. A single drop in the eye of certain pesticides is extremely hazardous. If the label requires goggles for eye protection, the handler must have immediate access to an eyewash container with a minimum of one pint per person at all times. Be prepared to wash a contaminated eye with clean water for as long as 15 minutes. Only an experienced applicator wearing the protective clothing and safety equipment prescribed by the manufacturer should handle highly toxic pesticides, such as concentrated organophosphates or carbamates.

2.2 Applying Pesticides

Before using a pesticide, read and obey all labeling instructions. Always have the label readily available when applying a pesticide.

- Do **not** handle or apply pesticides if you have a headache or do not feel well. **Never** smoke, eat or drink (or use cell phones!) while handling pesticides. **Avoid** inhaling pesticide sprays, dusts, and vapors. If the pesticide is dangerous to your respiratory system, the label will tell you to wear a respirator and specify which type (see Respiratory Protection Devices for Pesticides in this Section).
- Thoroughly wash exposed areas of yourself before eating, drinking, using tobacco products, using the bathroom, or using your cell phone. Wash your gloves with soap and water before you take them off. Then wash your hands and face.
- If hands, skin, or other body parts become contaminated or exposed, wash the area immediately with clean water and a liquid detergent. If clothing becomes contaminated, remove it immediately. If you splash a concentrate of a pesticide labeled with a “Danger” or “Warning” signal word, take your contaminated clothing off immediately and dispose of it; do not wash these items!
- After each spraying or dusting, bathe and change your clothing; always begin the day with clean clothing. Wash contaminated clothing separately and run an extra rinse cycle afterwards.
- Always have someone with you or close by if you are using highly toxic pesticides (those with the signal word **DANGER** plus skull and crossbones).

Apply the Correct Dosage

- To avoid excessive residues on crops for feed and food
- To achieve optimum pest control and minimum danger to non-targeted organisms
- To avoid chemical damage to the crops
- To obtain the most economical control of pests.

Use pesticides for only those crops specified on the label, and use only those that have state and federal registration. Avoid drift to non-targeted areas. Dusts drift more than sprays; air blast sprays drift more than boom sprays. When cleaning or filling application equipment, **do not** contaminate streams, ponds, or other water supplies. Always keep a record of all pesticides used (dates, locations, quantities).

2.3 Pesticide Transport

When pesticides are transported in a service vehicle to an application site outside the farm boundaries, the transport vehicle must be clearly marked as a pest control service vehicle in most states and for Category 7 operators in Delaware. Containers must be well secured to prevent breakage or spillage. If pesticide containers are glass, pad and secure them to prevent breakage. When containers are larger than 5 gallons, tightly brace them to a structural part of the vehicle to prevent accidental spills. Carry a supply of absorbent material to soak up or contain any liquid spills. Keep a shovel and/or broom and pan in the transport vehicle to help quickly contain any spills. Carry a working fire extinguisher (10 - B: C dry chemical, or carbon dioxide) on board as well. While under transport, pesticides must be stored in a separate compartment from the driver such as the bed of a pick-up truck or a van equipped with a partition. All pesticide containers and equipment must be secured to the vehicle so as to prevent removal by unauthorized person(s) when the vehicle is unattended. The door or hatch of any service vehicle tank containing a pesticide must be equipped with a cover that will prevent spillage when the vehicle is moving. The above requirements do not apply if the pesticide is being transported within the application equipment tank. **For additional information on pesticide transport, contact your state pesticide regulatory agency or Cooperative Extension Pesticide Safety Education Program.**

2.4 Pesticide Storage

Pesticides should always be stored in their original containers and kept tightly closed. Always read the label. Special storage recommendations or restrictions will be included. Write the purchase or delivery date of the product on the label with indelible ink. Products may lose their effectiveness over several years. Check for expiration dates in case they are included on the label. **For the protection of others, and especially in case of fire, the storage area should be posted as *Pesticide Storage* and kept securely locked.**

Herbicides, especially hormone-like weed killers such as 2,4-D, should **not** be stored with other pesticides - primarily insecticides and fungicides - to prevent the accidental substitution of the herbicide for these chemicals.

Store pesticides in a cool, dry, well-ventilated area that is not accessible to children and others who do not know and understand their safe and proper use.

Any restricted use pesticide or empty containers contaminated with their residues **must** be stored in a secure, locked enclosure while unattended. That enclosure must bear a warning that pesticides are stored there. If any pesticide must be stored in other than its original container (for example if the original container is leaking), that container must be labeled with the name and concentration of the active ingredient and the signal word and warning statements for the pesticide. Keep an inventory of all pesticides held in storage and locate the inventory list in an accessible place away from the storage site, so it may be referred to in case of an emergency at the storage site.

Keep your local fire department informed of the location of all pesticide storage locations. Fighting a fire that includes smoke from burning pesticides can be extremely hazardous. A fire with smoke from burning pesticides may also endanger the people of the immediate area or community. The people of an area or community may have to be evacuated if the smoke from a pesticide fire drifts in their direction. In **New Jersey**, applicators are required to send an inventory with the exact location of pesticides in storage to their local fire department by May 1st each year. For templates, see Rutgers Pesticide Safety Education Program's website at:

<http://pestmanagement.rutgers.edu/pat/record-forms/>

Pesticides may deteriorate due to storage conditions. Table D-1 provides general signs of deterioration.

Table D-1. Deterioration of Pesticides

Formulation	General Signs of Deterioration
EC	Evidence of separation of components, such as sludge or sediment. Milky appearance does not occur when water is added.
Oils	Milky appearance does not occur when water is added.
WP, SP, WDG	Excessive lumping; powder does not suspend in water.
D, G, WDG	Excessive lumping or caking.

Winter Storage of Pesticides

Plan pesticide purchases so that supplies are used by the end of the growing season. When pesticides are stored for the winter, keep them at temperatures above freezing, under dry conditions, and away from direct sunlight. After freezing, place pesticides in warm storage, 50-80°F (10-27°C), and shake or roll container every few hours to mix product or eliminate layering. If layering persists or if all crystals do not completely dissolve, do not use product. If in doubt, call the manufacturer for guidance. Table D-2 provides winter storage recommendations. Additional information can be obtained from manufacturers' websites.

Table D-2. Winter Storage of Chemicals¹

Chemical	Heated storage required	Heated storage not required	Quality questionable after freezing	Usable after freezing if put in warm storage	Usable after freezing if put in warm storage and shaken	Quality damaged by high temperatures
acephate						x
Alanap-L					x	
Atrazine 4L		x		x		
<i>Bacillus thuringiensis</i>		x				x
Banvel		x		x		
Basagran	x				x	
Benlate		x				
captan WP		x				
chlorothalonil					x	
Cythion 5E					x	x
Dacthal WP		x				
diazinon		x		x		
dimethoate	x		x			
Dual Magnum		x		x		
Eptam 7E			x		x	
Fusilade DX		x		x		

Table continued on next page

D Pesticide Safety

Table D-2. Winter Storage of Chemicals - continued

Chemical	Heated storage required	Heated storage not required	Quality questionable after freezing	Usable after freezing if put in warm storage	Usable after freezing if put in warm storage and shaken	Quality damaged by high temperatures
Goal 2XL	x					
Gramoxone	x				x	
Imidan WP		x				
Lannate	x				x	
Lexone 4L	x		x			
Lorox 4L	x		x			
Lorsban		x			x	
malathion EC		x			x	x
Micro-Tech	x				x	
Monitor 4E		x		x		
Partner	x				x	
Poast 1.5EC	x				x	
Pounce		x			x	
Prefar 4E	x		x			
Prowl EC	x		x			
Pursuit	x			x		
Roundup Ultra Max	x		x			
Sencor 4F		x			x	
Sevin		x			x	
Solicam 80DF		x				
Surflan AS		x			x	
Treflan EC	x		x			
2,4-D amine	x		x			
Vydate L	x					

¹Adapted from "Vegetable Newsletter," by Chris Doll, Illinois County Extension agent; the Cornbelt Chemical Company, McCook, Nebraska; and the "American Cemetery" magazine.

2.5 Disposal of Pesticides

Pesticides should not be disposed of in sanitary landfills or by incineration, unless disposal sites and equipment are especially designed and licensed for this purpose by your state. The best method to dispose of a pesticide is to use it in accordance with current label requirements.

The **triple rinse-and-drain** procedure or the **pressure-rinse** procedure is the recommended method to prepare pesticide containers for safe disposal (see below). This method can save you money as well as protect the environment. Crush or puncture the container for disposal in a sanitary landfill or deposit in landfills that accept industrial waste, or deliver the intact container to a drum reconditioner or recycling plant. Check with the landfill operator prior to taking empty containers for disposal. For additional information on the disposal of pesticides themselves or unrinsed containers or rinsate, call the state agency responsible for hazardous wastes.

Organic Phosphate Pesticides: The handling and disposal of waste organic phosphates is a specialized job. Many organophosphorous compounds break down by hydrolysis; most of these chemicals decompose much faster in alkaline situations than in acids or neutral solutions.

Carbamate Pesticides: Usually these chemicals decompose rapidly in soil; many break down much faster in an alkaline situation. An example of such carbamate chemicals is carbaryl.

2.6 Disposal of Containers

Triple Rinse-and-Drain Method: To empty a pesticide container for disposal, drain the container into the spray tank by holding container in a vertical position for 30 seconds. Add a solvent, capable of removing the pesticide, to the pesticide container, so that it is approximately one-fourth full. Agitate the container thoroughly, and then drain the liquid (rinsate) into the spray tank by holding in a vertical position for 30 seconds. Repeat two more times.

Pressure Rinse Method: An optional method to rinse small pesticide containers is to use a special rinsing device on the end of a standard water hose. The rinsing device has a sharp probe to puncture the container and several orifices to provide multiple spray jets of water. After the container has been drained into the sprayer tank (container

is upside down), jab the pointed pressure rinser through the bottom of the inverted container. Rinse for at least 30 seconds. The spray jets of water rinse the inside of the container and the pesticide residue is washed down into the sprayer tank for proper use. Thirty seconds of rinse time is equivalent to triple rinsing. An added benefit is the container is rendered unusable. In Pennsylvania, this permits the containers to be disposed of as solid waste (not hazardous waste) in an ordinary landfill.

3. Soil Fumigants

EPA requires safety measures for use of the soil fumigants chloropicrin, dazomet, metam sodium/potassium, and methyl bromide. Each manufacturer is required to develop and implement training programs for applicators in charge of soil fumigation so these applicators are better prepared to effectively manage fumigant operations. Training must be completed every 3 years. Currently EPA-approved soil fumigant training for certified applicators may be found at: <https://www.epa.gov/soil-fumigants/soil-fumigant-training-certified-applicators>.

Soil fumigant labels require users to prepare a site-specific fumigation management plan (FMP) before the application begins. EPA has developed fumigant management plan templates that fulfill the elements required by the labels; see <https://www.epa.gov/soil-fumigants/fumigant-management-plan-templates-phase-2-files-listed-chemical>. Alternately, users may develop their own fumigant management plan or use one developed through an outside vendor to meet the label requirements rather than using these templates.

Some states currently require pesticide applicator certification categories for soil fumigation. These states may develop separate manuals, or they may use a national manual/certification study guide, the “National Soil Fumigation Manual”. A low-resolution copy can be viewed/downloaded at: <http://www.ctaginfo.org/>. Additionally, some states will be requiring applicators to notify their state’s licensing agency prior to use of these fumigants.

New Jersey: Currently, New Jersey does not have a separate license requirement for use of soil fumigants. Private applicators do not have to have an additional license to apply soil fumigants in New Jersey. However, private applicators are still required to read and follow all elements of the soil fumigant label, just like any other pesticide. In New Jersey there is no requirement for notification of soil fumigant use to the NJDEP. Rutgers has a limited stock of the national Soil Fumigation Manual (cited above) available to NJ applicators to use as a reference.

Please contact your state’s applicator certification agency or your state Extension pesticide safety education program for state-specific regulations. You may contact either for further assistance.

4. Farm Worker Safety

4.1 Regulations

In April of 1994, the U.S. Environmental Protection Agency (EPA) implemented new regulations on worker safety, which are impacting agriculture throughout the U.S. These regulations, called the Federal Worker Protection Standard – CFR Title 40, Part 170 (WPS), provide specific safety requirements for both pesticide handlers and general agricultural workers. Farm workers must be informed about the pesticides with which they may come in contact. The following is a brief overview of some of these regulations.

1. Farm workers who enter treated fields within 30 days of an application of a pesticide must be trained as specified under the Worker Protection Standard (WPS) requirements.
2. No worker can enter a treated field before the end of the label specified restricted-entry interval (REI) unless properly protected. All WPS-labeled pesticide products are required to have a prescribed REI. These range from 4 to 48 hours or longer. Check your pesticide's label for the reentry time in effect. Some pesticides have one REI, such as 12 hours, for all crops and uses. Other products have different REIs depending on the crop or method of application. When two (or more) pesticides are applied at the same time, and have different REIs, you must follow the longer interval.
3. Employers must provide pesticide handlers protective equipment necessary may include socks, shoes, long pants, long-sleeve shirt, and a hat. Additional safety equipment may also be required by the label.
4. Farm workers must be verbally informed, in their native language, of all REIs if treated fields are not posted with the prescribed WPS warning sign during the reentry period. If workers are not verbally notified or the label requires it, treated fields must be posted with the prescribed WPS warning sign during the reentry period.
5. For all pesticides, workers must be warned by posting a bulletin board at a point(s) where workers might assemble. *(continued on next page)*

D Pesticide Safety

This bulletin board should have a listing of the following information:

- a. Location and name of crop treated,
- b. Brand name and common chemical of pesticide applied,
- c. Date of application, and
- d. Date of safe reentry into treated area.

For example in New Jersey. The bulletin board should also include a map of the farm which designates the different areas of the farm which might be treated. The required information must also be listed using column headings as defined by New Jersey Department of Environmental Protection, and must be in the native language of workers, in addition to English, if they do not read English. This information must be posted either before workers enter treated fields or prior to workers entering fields at the beginning of the next workday, whichever occurs first. Once posted, this information must remain posted for 30 days following the date for safe reentry.

6. Every farm must post the WPS safety poster in a central area at the farm where farm workers are able to view it.
7. Agricultural employers must also provide a decontamination site that includes water, soap, and single use towels for all farm workers who enter treated areas of the farm.

These requirements are being implemented in different ways in each state. For additional information on these and other state farm worker regulations, contact your state pesticide regulatory agency or local Cooperative Extension office.

The US Environmental Protection Agency (EPA) revised its 1992 Agricultural Worker Protection Standard (WPS) on November 2, 2015. Compliance requirements for agricultural employers and handler employers are effective on January 2, 2017; and later on January 1, 2018. EPA's changes to the WPS are listed below, followed by information on compliance assistance resources for agricultural employers.

In the revised rule, EPA specifically summarizes the changes to the WPS as:

- Requiring pesticide safety training at one-year intervals and amending the existing pesticide safety training content.
- Requiring recordkeeping for pesticide safety training.
- Eliminating the “grace period” that allowed workers to enter a treated area to perform WPS tasks before receiving full pesticide safety training.
- Establishing a minimum age of 18 for handlers and for workers who enter an area under a restricted entry interval (REI).
- Establishing requirements for specific training and notification for workers who enter an area under an REI.
- Restricting persons' entry into certain areas surrounding application equipment during an application.
- Clarifying requirements for supplies for routine washing and emergency decontamination.
- Requiring employers to post warning signs around treated areas when the product applied has an REI greater than 48 hours and allowing the employer to choose to post the treated area or give oral notification when the product applied has an REI of 48 hours or less (unless the labeling requires both types of notification).
- Requiring employers to maintain and make available copies of the Safety Data Sheets (SDSs) for products used on the establishment.
- Requiring employers to provide application information and SDSs to designated representatives making the request on behalf of workers or handlers.
- Adding elements to the requirement to maintain application-specific information.
- Adopting by cross reference certain OSHA requirements for employers to provide training, fit testing and medical evaluations to handlers using products that require use of respirators.
- Requiring employers to provide supplies for emergency eye flush at all pesticide mixing and loading sites when handlers use products that require eye protection.
- Maintaining the immediate family exemption and ensuring it includes an exemption from the new minimum age requirements for handlers and early-entry workers.
- Expanding the definition of “immediate family” to allow more family-owned operations to qualify for the exemptions to the WPS requirements.
- Revising definitions to improve clarity and to refine terms.

Compliance Assistance

EPA is providing resources to agricultural employers and handler employers to assist with compliance with the Revised WPS in conjunction with the Pesticide Educational Resources Collaborative (PERC). Key resources already developed and posted at the PERC website (<http://pesticideresources.org/>) are:

- “Quick Reference Guide to the Worker Protection Standard (WPS) as Revised in 2015”; see <http://pesticideresources.org/wps/hosted/quickrefguide.pdf>. This one-page double-sided chart outlines requirements with direct hyperlinks to the text of the regulation for each item being cited in the chart.
- “How to Comply With the 2015 Revised Worker Protection Standard For Agricultural Pesticides”; see <http://pesticideresources.org/wps/htc/index.html>. The purpose of this online guide is to help users of agricultural pesticides comply with the requirements of the revised federal Worker Protection Standard.

PERC will use email distribution lists to keep interested parties informed about new publications. PERC has developed lists for several target groups, including “Agricultural Employers and Handler Employers” to distribute notices relevant to agricultural employers and commercial pesticide handler employers, as defined by the WPS. See <http://pesticideresources.org/lists.html> to enroll in the email list(s) of your choice.

Please refer to your State pesticide regulatory agency for state-specific regulations and policy on the Revised WPS. **In cases where state rules are more stringent than federal, the state rules will take primacy.**

Contact your local Extension offices and state Extension Pesticide Safety Education Program (PSEP) for further assistance. Some state PSEP Programs, such as Rutgers New Jersey PSEP, will be providing WPS outreach to agricultural producers at conferences, meetings, its Farm Safety webpages (which can be accessed at <http://pestmanagement.rutgers.edu/>), and the Plant and Pest Advisory blog.

4.2 Protecting Yourself from Pesticides

Personal Protective Equipment (PPE)

Wearing PPE can greatly reduce the potential for dermal, eye, oral, and inhalation exposure; and thereby significantly reduce the chances of pesticide poisoning or injury. PPE includes such items as coveralls or protective suits, aprons, gloves, footwear, headgear, eyewear, and respirators. When selected correctly, these all reduce the risk of dermal exposure; but they do not eliminate it. All PPE should either be disposable, or easy to clean and sturdy enough for repeated use.

Coveralls

If the pesticide label only lists ‘coveralls’, it is allowable to wear a coverall made of any fabric, including wovens (like cotton or twill); as well as disposable non-wovens. These do not have to be chemical resistant.

Chemical Resistant PPE

Generally speaking, labels will specify PPE that is “chemical resistant” for protecting the body from moderately toxic (signal word ‘Warning’) or highly toxic (label signal word ‘Danger’) pesticides. However, that may not always be the case for specific products; always follow the label.

It is important that all pesticide handlers understand the limitations of PPE. Different types of PPE are not equally resistant to all pesticides and under all conditions. Chemical resistance of a given protective suit, for instance, can vary between different pesticides. Some materials restrict pesticide entry for a long time, while others allow the pesticide to pass through quickly.

There are several criteria for chemical resistance: penetration, degradation, and permeation. Penetration occurs when the chemical leaks through seams, pinholes, and other imperfections in the material. Degradation is a reduction in one or more physical properties of PPE due to contact with a chemical; it essentially starts to break down. Permeation is the process by which a chemical moves through protective material on a molecular level; measured as a volume per area overtime. Breakthrough is what occurs when there is complete passage of a pesticide to the inside of PPE, measured in elapsed time. Once this occurs, your skin is directly exposed to the pesticide.

In some instances, degradation of protective fabric is easy for applicators to recognize. PPE may swell, discolor, shrink, soften, become brittle, or change texture. Be alert for these signs and replace compromised clothing immediately to minimize your exposure to pesticides.

Permeation of a pesticide into a material may begin as soon as it gets on its surface. Once a pesticide is absorbed onto the surface of a garment, it is difficult to detect or decontaminate. In these cases, the pesticide continues to

D Pesticide Safety

move into and through the PPE. How fast a given pesticide moves through different PPE materials (its permeation rate) can vary widely. Things that can affect the extent of permeation are contact time, concentration, temperature and physical state of the contaminant.

Pesticide breakthrough of PPE can occur without any noticeable signs. If a material is not chemical resistant to a pesticide, complete passage through it can occur very quickly, in just minutes.

Pesticide residues that remain on PPE are likely to continue to permeate through the material once contaminated.

If using “reusable” PPE, pay close attention and be ready to change them whenever the inside surface is contaminated or there are signs of pesticide permeation. Even if you do not see any signs of wear, replace reusable chemical-resistant items regularly - the ability of a chemical-resistant material to resist the pesticide decreases each time an item is worn.

Be sure to clean all reusable PPE items between uses, even if worn for only a brief period of exposure. If you wear that PPE again, pesticide may already be on the inside of the material next to your skin. In addition, PPE worn several times between launderings may build up pesticide residues. The residues can reach a level that can harm you, even if you are handling pesticides that are not highly toxic.

Disposable PPE is a preferred option to reusable PPE. They are low-cost, and their use minimizes clean-up and spread of contamination.

Selecting chemical resistant PPE

Always follow the pesticide label directions for what is required for you to use under the law. For pesticide handlers, the precautionary statement on the pesticide label indicates if chemical-resistant PPE is required. For workers performing “early entry” tasks, the Agricultural Use Requirements box on the label indicates PPE requirements.

For gloves, labels will often specify materials that are chemical resistant for that product. Older pesticide labels may add another statement that you can consult an EPA chemical resistance category chart for more options. In these cases, the glove type that provides highest protection is listed. Use only those listed.

In some cases, a pesticide label may say “wear chemical-resistant PPE” without specifying the material that protects you. This is more typically the case for suits, aprons, boots, and headgear. In these circumstances, you should consult the PPE manufacturer or their literature (often available online). They can recommend the best garments/gloves to wear with the pesticide that you will be using. Consult the pesticide manufacturer to find out what PPE they recommend to be chemical resistant. You can also contact your state Cooperative Extension pesticide safety office for assistance.

Gloves

The area of the body receiving most exposure from pesticides is hands and forearms. Research has shown that workers mixing pesticides received 85 percent of the total exposure to the hands and 13 percent to their forearms. The same study showed that wearing chemical-resistant gloves reduced exposure by 99 percent (*Source: The Farm Family Exposure Study, John Acquavella*).

Wear the type of chemical-resistant glove specified by the product labeling. Select glove materials according to the label, or by chemical resistance charts, or manufacturer directions. Make sure not to use gloves made of any kind of absorbent material, leather, cloth, cloth-lined, or flocked, unless specified by the label. All of these materials can absorb pesticides, and hold them against your skin. Cotton gloves may be prescribed on the label in very specific uses such as protection for certain fumigants including aluminum phosphide. Always use label-prescribed gloves.

Gloves, non-woven (including coated non-woven) coveralls and hoods, such as Tyvek®, usually are designed to be disposed of after use. Most are intended to be worn for only one work day. For example, you might use disposable gloves, shoe covers, and an apron while pouring pesticide into a hopper or tank, cleaning or adjusting a nozzle, or making minor equipment adjustments. Place disposable PPE in a separate plastic bag or container prior to disposal.

Footwear

Pesticide handlers often get pesticides on their feet. Sturdy shoes and socks may be sufficient to protect your feet during many handling activities. However, some product labels require that you wear waterproof or chemical-resistant footwear.

If the product labeling specifies “chemical-resistant footwear”, you can wear any chemical-resistant shoes; boots; or shoe coverings worn over shoes or boots. Leather or canvas footwear is not chemical resistant; they absorb pesticides and cannot be decontaminated. Do not wear leather boots in these cases.

Eye Protection

Eyes readily absorb pesticides. When a label simply says to “wear protective eyewear”, you may use any of the following: goggles; face shield; safety glasses with shields at front, brow and temple; or a full-face respirator. Select goggles made of impact-resistant material such as polycarbonate. Goggles that have covered air baffles reduce lens fogging while keeping liquids out. Under the agricultural Worker Protection Standard, if the label requires goggles for eye protection, then the handler must have immediate access to **eyewash container** at all times. Regulations require a minimum of a pint per person.

4.3 Respiratory Protective Devices for Pesticides

You may be subject to exposure to toxic gases, vapors, and/or particulates when using pesticides. Although your respiratory (breathing) system tolerates a limited exposure, some chemicals can impair or destroy portions of the system. For many pesticides, the respiratory system is the quickest and most direct route into the circulatory system, allowing rapid transport throughout the body. Thus, it is important to follow the pesticide label and employ directions for control of exposure, especially when respiratory protection is specified.

A respirator is a safety device covering at least the mouth and nose that protects the wearer from contaminated air. Respiratory protection varies in design, use, and protective capacity. There are two major **classes** of respirators:

1. Air-purifying respirators that remove contaminants from the air.
2. Atmosphere-supplying respirators that provide clean, breathable air from an uncontaminated source.

Air-purifying respirators may be powered or non-powered. A powered air-purifying respirator uses a blower to pass contaminated air through purifying elements. Non-powered air-purifying respirators may be designed for single use or with replaceable filters, canisters, or cartridges. Air-purifying respirators **DO NOT** supply oxygen and should never be used when oxygen may be limited (<19.5 percent oxygen by volume) or when an environment is immediately dangerous to life or health (IDLH).

Purifying elements for air-purifying respirators contain a filter, sorbent, or catalyst (or a combination of these items) to remove specific contaminants from the air passing through the container. When pesticides are used, particulates may be present as solids and/or liquids. When this is the case, a particulate respirator (or filter) is prescribed for use. Pesticide products may be present as gases or vapors. When this is the case, a contaminant-specific chemical cartridge or canister is prescribed. Be sure that the respirator assembly (with component purifying element) is approved for protection against the pesticide you intend to use (see "Selection of Respirator Type" below). Respirators approved only for use against particulates must not be used for gases and vapors.

Air-supplying respirators include supplied-air respirators and self-contained breathing apparatus. These respirators should be used when oxygen is limited. However, the only type of atmosphere-supplying respirators that may be used in an IDLH environment is a **pressure-demand**, self-contained breathing apparatus. The breathing air supply for these respirators should meet or exceed the specification for Grade D breathing air as described in the most current Compressed Gas Association Specification G-7.1.

See: <https://www.osha.gov/publications/OSHA3079.pdf>.

Certification of Respirators

Standards, testing, and certification assure the commercial availability of safe, personal protective devices. The National Institute for Occupational Safety and Health (NIOSH) certifies respirators for the contaminant or situation of exposure. **When purchasing a new respirator, the certification numbers per respirator type, are as follows:**

- TC-13F-XXXX: self-contained breathing apparatus
- TC-14G-XXXX: gas masks with canisters
- TC-19C-XXXX: supplied air respirators
- TC-21C-XXXX: **powered** particulate respirators **only** (with HE filter only)
- TC-23C-XXXX: chemical cartridge respirators
- TC-84A-XXXX: **non-powered** particulate respirators (with N, P, and R series filters)

There are nine classes of particulate filters based upon filter efficiency and oil degradation resistance.

The nine new classes and prescribed use of each are as follows:

- N95: Not oil-resistant; moderate filtering efficiency
- R95: Oil-resistant; moderate filtering efficiency
- P95: Oil-proof; moderate filtering efficiency

(List continued on next page)

D Pesticide Safety

- N99: Not oil-resistant; high filtering efficiency
- R99: Oil-resistant; high filtering efficiency
- P99: Oil-proof; high filtering efficiency
- N100: Not oil-resistant; highest filtering efficiency (99.97%)
- R100: Oil-resistant; highest filtering efficiency (99.97%)
- P100: Oil-proof; highest filtering efficiency (99.97%)

Although there are three distinct efficiency levels for filters, most manufacturers are marketing only the 95% to 99.97% efficiency filters as listed above. If you previously used a high efficiency particulate air filter (HEPA), a filtering unit with 99.97% filtering efficiency would be comparable. The appropriate N-, R-, or P-series for the filter will still need to be chosen. If the pesticide label specifies N-, R-, or P-series filtering elements, do not use the N-series when oil is present. The class of the filter will be clearly marked on the filter, filter package, or respirator box. In the case of chemical cartridges that include these filter elements, similar markings will be present.

Selection of Respirator Type

Manufacturers now provide recommendations for appropriate respiratory protection on the pesticide label. These label recommendations are product and task specific. For example, manufacturers may specify organic vapor cartridges or canisters in formulations where the solvent carrier for the pesticide active ingredient is petroleum based. **It is extremely important** to read and follow the product label for respirator requirements since pesticides may have different formulations and use directions.

EPA provides pesticide manufacturers' specific **pesticide label statements for respiratory protection** for five categories of pesticide formulation and application activity.

Service Life of Filters

The service life of all filters is limited and all soiled filters should be replaced whenever they are damaged or cause noticeably increased breathing resistance.

The effective service life of a chemical cartridge respirator depends on the conditions of use. Conditions include the type and concentration of contaminant(s), user's breathing rate, and humidity. Cartridges should remain sealed until ready to use. Make sure to use cartridges within the manufacturer's prescribed cartridge shelf life.

Chemical cartridge respirators, when selected appropriately, are essentially 100 percent efficient until the gas or vapor "breaks through." The service life for chemical cartridges can be identified by: warning properties (smell, taste, irritation); chemical specific end-of-service-life-indicators (ESLI); and predetermined conservative change-out schedules. Reliance on warning properties is problematic due to a wide variation in odor threshold in the general population. The availability of ESLI is limited. Consult pesticide and respirator manufacturers, as well as NIOSH, OSHA, and EPA guidance when establishing a cartridge change-out schedule. Cartridges should be changed immediately whenever breakthrough is detected in the mask. Always dispose of chemical cartridges at the end of a workday. Never reuse a chemical cartridge.

Use and Care of Respirators

The most commonly used facepiece configurations for pesticide use are either half-masks or full-face masks. Half-face masks are typically available as single-use or with cartridges that are replaceable with each use. Full-face masks provide eye protection and a better seal; most full-face masks are sized small, medium, and large affording enhanced fit to the face. Full-facepieces, half-masks, quarter-masks, and different brands of the same type respirator have different fit characteristics. A qualitative or quantitative fit test of a given mask type on a user's face must be performed in order to select the best fitting respirator. Kits for qualitative testing are commercially available.

Prior to using a respirator, read and understand the manufacturer's instructions that are supplied with the respirator and its component parts. All respirators must be inspected for wear and deterioration of their components before and after each use. Special attention should be given to rubber or plastic parts that can deteriorate. Replacement component parts are available from most manufacturers.

Wearers should perform both positive and negative seal checks every time respirator masks are put on. This will ensure that the respirator is properly sealed on the face and that all inhalation and exhalation ports are functioning properly. Facial hair (*i.e.*, beards and mustaches) prevents the formation of a good seal and may negate any benefit gained by wearing a respirator.

- To perform a positive pressure seal check, cover the exhalation port with the palm of your hand and exhale into the mask. You will feel air escaping at any gaps in your seal. Readjust the mask until there is no leakage.

- To perform a negative pressure seal check, cover or seal off the surface or hose where air is inspired and suck in. A properly sealed mask should collapse on your face with no signs of leakage in the facepiece or hoses. Readjust the mask until there is no leakage.

After using the respirator, remove and properly dispose of any expendable components such as filters, cartridges, or canisters. Wash the facepiece in a cleaning/sanitizing solution as recommended by the respirator manufacturer. Take care to clean under and around gaskets and valves allowing components to air dry. Store cleaned respirators, as well as replacement purifying elements, in a clean dry place that is not exposed to sunlight or extreme temperatures. Do not store any protective equipment, including respirators, with or near chemicals such as pesticides.

Call your state's Extension office to refer you to the pesticide safety education coordinator if you have any questions about pesticide safety equipment.

4.4 Pesticide Poisoning

If you have any of the following symptoms during or shortly after using pesticides: headache, blurred vision, pinpoint pupils, weakness, nausea, cramps, diarrhea, and discomfort in the chest, call a physician and the Poison Control Center (1-800-222-1222 for all states) or agency in your state. Anyone with a pesticide exposure poisoning emergency can call the toll-free telephone number for help. Personnel at the Center will give you first-aid information and direct you to local treatment centers if necessary. **For immediate medical attention call 911. Prompt action and treatment may save a life.**

In Case of an Accident

- **Remove the person from exposure.**
- **Get away from the treated or contaminated area immediately.**
- **Remove contaminated clothing.**
- **Wash with soap and clean water.**
- **Call a physician and the Poison Control Center (1-800-222-1222) or agency in your state.**
- **Be prepared to give the active ingredient name (common generic name) to the responding center/agency.**



5. Protect the Environment

5.1 General Guidelines

- Always read the pesticide label and check for environmental concerns and restrictions.
- Do not burn pesticides. The smoke from burning pesticides is toxic and can pollute air.
- Do not dump pesticides in sewage disposal or storm sewers, because this will contaminate water.
- Avoid using excess quantities of pesticides. Calibrate your sprayer to make sure of the output.

General Guidelines continued on next page

D Pesticide Safety

General Guidelines to Protect the Environment - continued

- Adjust equipment to keep spray on target. Chemicals off-target pollute and can do harm to fish, wildlife, honeybees, and other desirable organisms.
- Keep pesticides out of ponds, streams, and water supplies, except those intended for such use. A small amount of drift can be hazardous to food crops and to wildlife. Empty and clean sprayers away from water areas.
- Protect bees and other beneficial insects by choosing the proper chemical and time of day for application.
- See additional precautions in section “Protecting Our Groundwater.”

Minimize Spray Drift

- Avoid spraying when there is strong wind.
- Use large orifice nozzles at relatively low pressure.
- Use nozzles that do not produce small droplets.
- Adjust boom height as low as practical.
- Do not spray at high travel speeds.
- Spray when soil is coolest and relative humidity is highest.
- Use nonvolatile pesticides.
- Use drift control additives when permitted by the pesticide label.

5.2 Notification of Beekeepers

To avoid conflicts and possible lawsuits, it is advisable to always provide notification of insecticide applications to beekeepers within three miles from your site. In New Jersey, this is mandatory, as follows: Beekeepers registered with the New Jersey Department of Environmental Protection (DEP) must be notified before certain pesticides are applied. Growers using pesticides on vine crops (June through August), strawberries (April 15 to May 15), or sweet corn (during flowering stage), or in fields where flowering weeds are present that have information on the label indicating the pesticide is toxic to bees must notify beekeepers within three miles of the target site at least 24 hours prior to application. Notification must include approximate date and time of application; location, brand name, and active ingredient of the pesticide to be used; and the name and registration number of the certified pesticide applicator(s). Notification can be made by phone, regular or certified mail as long as it is received 24 hours before the application. A list of registered beekeepers can be obtained by writing to:

New Jersey Department of Environmental Protection Pesticide Control Program,
PO Box 420, Trenton, NJ 08625-0420

For more detailed information and regulations, consult the Pesticide Control Program (<http://www.nj.gov/dep/enforcement/pcp/bpo.htm>) or the Rutgers Cooperative Extension Pesticide Safety Education Program (<http://pestmanagement.rutgers.edu/rutgers-pesticide-safety-education-program/>).

5.3 Protecting Your Groundwater

Groundwater is the water contained below our soils. This water is used by 90% of the rural population in the United States as their sole source of drinking water. Contamination of our water supply by pesticides and other pollutants is becoming a serious problem. One source of contamination is agricultural practices. **Protection of our groundwater by the agricultural community is essential.**

Groundwater collects under our soils in aquifers that are comprised of layers of sand, gravel or fractured bedrock which, by their nature, hold water. This water comes from rainfall, snowfall, etc., that moves down through the soil layers to the aquifer. The depth of the aquifer below the surface depends on many factors. Where it is shallow, we see lakes, ponds and wetlands.

Factors That Affect Movement of Water and Contaminants

The depth of aquifers, in conjunction with soil types, influences how much surface water reaches the aquifer. Their depth also affects how quickly water and contaminants reach an aquifer. Thus, shallow water tables tend to be more vulnerable to contamination than deeper ones.

This tendency, however, depends on the soil type. Soils with high clay or organic matter content may hold water longer and retard its movement to the aquifer. Conversely, sandy soils allow water to move downward at a fast rate. High levels of clay and/or organic content in soils also provide a large surface area for binding contaminants that

can slow their movement into groundwater. Soil texture also influences downward water movement. Finer textured soils have fewer spaces between particles than coarser ones, thus decreasing movement of water and contaminants.

Chemistry Plays a Role

The characteristics of an individual pesticide affect its ability to reach groundwater. The most important characteristics are solubility in water, adsorption to soils, and persistence in the environment.

Pesticides that are highly soluble in water have a higher potential for contaminating groundwater than those which are less soluble. The water solubility of a chemical indicates how much chemical will dissolve in water and is measured in parts per million (ppm). Those chemicals with a water solubility greater than 30 ppm may create problems.

A chemical's ability to adhere to soil particles plays an important role. Chemicals with a high affinity for soil adsorption are less likely to reach the aquifer. Adsorption is also affected by the amount of organic matter in the soil. Soils with high organic matter content are less vulnerable than those with low organic matter content.

Finally, how persistent a chemical is in the environment may affect its ability to reach groundwater. Those which persist for a long time may be more likely to cause contamination than materials which breakdown quickly. Persistence is measured by the time it takes half of a given pesticide to degrade (half-life). Chemicals with an overall estimated half-life longer than 3 weeks pose a threat to groundwater.

How to Prevent Contamination of Your Ground Water

1. Examine the chemical properties of the pesticides that you use. If you are using materials which persist for long periods of time, are very water soluble, or are not tightly held by the soil, then you may be contaminating your groundwater. You may wish to select another material that has a shorter persistence, lower water solubility or higher potential for soil adsorption. The following table will assist you with these decisions.

Table D-3. K_d , K_{oc} , Water Solubility and Persistence Values for Selected Pesticides

Pesticide	Adsorption to Soil K_d^1	Adsorption to Organic Matter K_{oc}^1	Water Solubility (ppm) ²	Half Life (days) ³
alachlor	4.35	190	242	14
atrazine	127.00	160	33	60
Dacthal	--	5,000	0	30
disulfoton	32.30	2,000	25	4
fenamiphos	4.41	171	700	20
methomyl	0.03	28	57,900	8
metribuzin	0.11	41	1,200	30
oxamyl	0.16	1	280,000	7
S-metolachlor	--	200	530	20
terbacil	0.78	41	710	90

¹A lower K_d or K_{oc} number indicates a greater chance for groundwater contamination. ²A higher water solubility indicates a greater chance for groundwater contamination. ³A longer half-life indicates a greater chance for groundwater contamination.

2. Determine your local soil and geologic circumstances. If you are in an area with a shallow water table or your soil is low in organic matter or sandy in nature, you have a greater risk of contaminating your groundwater. In these cases, choose a pesticide that has a low water solubility and is not persistent (has a short half-life).
3. Evaluate your management practices. They may be the most important factor in determining your risk of contaminating your groundwater. If you use the same materials year after year, or many times a season, you can increase the potential for contamination due to the amount of pesticide in your soil. The timing of pesticide applications has an effect on groundwater contamination. If you make applications during periods of high rainfall or heavy irrigation, it is more likely that contamination may occur. Also, the water table in the spring may be higher than at other times. Early season applications, therefore, may pose a greater chance for groundwater contamination. Finally, the method of application may have an effect on ground water contamination. Direct injection, incorporation, and chemigation all increase the chance of contamination. If you use these techniques, be sure to follow the procedures listed on the material's label.
4. The location of your wells can be important. If your sprayer loading area or pesticide storage building is too close to your well, the risk of contamination may be greater. Wells used for drinking water or other purposes should be at least 50 feet away from pesticide storage buildings and loading areas. In the event of an accident,

D Pesticide Safety

this distance should prevent contamination. This minimum distance should also be followed for field irrigation wells. If they are too close to application areas, contamination might occur.

5. Check the condition of any wells in the vicinity of sprayer loading areas, pesticide storage areas or field applications. If they have cracked casings you are inviting trouble. Cracks in a well casing provide a direct point of entry for pesticide-contaminated water in the soil around the well.
6. Incorporate an anti-backflow device in any system used for chemigation or to fill your sprayer with water. In the event of a pump shutoff or other failure, if any back-flow into the water system occurs, these devices will prevent pesticides from entering your well. In many states these devices are now required for sprayers by laws.
7. Care and maintenance of your equipment is also an important consideration. If your equipment does not function properly, you may be applying more than is needed and increasing the chance of groundwater contamination. Prior to the season, inspect all of the working parts of your sprayer or chemigation system. Check the pump to see if it is working properly. For both sprayers and chemigation systems, check the water lines for clogs and leaks. For sprayers, check the nozzles for wear and clogs. Clogged, leaking or worn lines and nozzles can cause pesticides to be delivered excessively or in unwanted areas. Be sure to calibrate your equipment. Uncalibrated equipment can cause over delivery as well. You should calibrate your equipment at the beginning of the season, periodically during the remainder of the season and any time you make changes or adjustment to the equipment.
8. Apply materials only when needed. The use of extraneous pesticides can increase the threat of contamination. Check your irrigation practices as well. Don't irrigate immediately after a pesticide application, unless required by a pesticide's label. The increased water content in the soil might speed up the movement of a pesticide into ground water. **Remember, you must protect your groundwater.**

5.4 Pesticide Spills

Keep a supply of an absorbent agent on hand to scatter over liquid spills in the area that you store pesticides. Sawdust or janitorial sweeping compound works well in absorbing the liquids in a cleanup. Use a respirator and chemical resistant gloves to clean up spills. Barrier laminate gloves have a broad range of chemical resistance are a good choice to keep in a spill kit. Rubber gloves might break down depending on the pesticide. Let it soak a couple of hours to absorb the spilled pesticide from the floor. This procedure is also recommended for cleaning truck beds that are contaminated.

Specific information concerning pesticide cleanup can be obtained by calling the manufacturer directly or consulting the products' MSDS. **The phone numbers for emergencies are listed on every product label.** Information can also be obtained by calling CHEMTREC at 1-800-424-9300, or visiting <http://www.chemtrec.com/>. Report pesticide spills to the proper state agency.

Reporting of Pesticide Spills

For Delaware, Maryland, Pennsylvania, Virginia, and West Virginia, pesticide spills may be reported to the US EPA Region 3 Office (1-800-438-2474).

For New Jersey, any registered pesticide applicator, or any registered pesticide applicator business, shall immediately inform the DEP of any reportable pesticide spill (1 pound active ingredient or 1 gallon of liquid) occurring under such person's direct supervision and/or direct observation and shall provide the following information:

1. Name of the pesticide applicator
2. Name of the applicator business, if any
3. Name of the property owner or operator
4. Location of the incident
5. Name and EPA registration number of the pesticide
6. Estimated amount of pesticide involved
7. Corrective action taken

The report shall be made to the DEP hotline immediately by telephone. Call the Pesticide Control Program at 1 800-WARN-DEP (1-877-927-6337).

Submit a written follow-up within 10 days to the Pesticide Control Program, PO Box 420, Trenton, NJ 08625. (See: <http://www.nj.gov/dep/enforcement/docs/sdreport-rev5-12-14.pdf>)

6. Toxicity of Chemicals

The danger in handling pesticides does not depend exclusively on toxicity values. Hazard is a function of both toxicity and the amount and type of exposure. Some chemicals are very hazardous from dermal (skin) as well as oral (ingestion) exposure. Although inhalation values are not given, this type of exposure is similar to ingestion. A compound may be highly toxic but present little hazard to the applicator if the precautions are followed carefully.

Acute toxicity values are expressed as oral LD₅₀ in terms of milligrams of the substance per kilogram (mg/kg) of test animal body weight required to kill 50 percent of the population. The acute dermal LD₅₀ is also expressed in mg/kg. These acute values are for a single exposure and not for repeated exposures such as may occur in the field. Rats are used to obtain the oral LD₅₀ and the test animals used to obtain the dermal values are usually rabbits.

Table D-4. Acute Categories of Toxicity¹

Categories	Signal Word	LD ₅₀ Value (mg/kg)	
		Oral	Dermal
I	Danger-Poison	0-50	0-200
II	Warning	50-500	200-2,000
III	Caution	500-5,000	2,000-5,000
IV	Caution ²	> 5,000	> 5,000

¹EPA accepted categories. For examples of each category, see Table D-6 (Toxicity of Chemicals).

²No signal word required based on acute toxicity; however, products in this category usually display "Caution."

Read the labels and become familiar with the symptoms of pesticide poisoning. For help in a pesticide emergency, call the Poison Control Center 1-800-222-1222 (for all states).

Toxicity and LD₅₀ Calculations

Weight Conversions:

1 ounce (oz) = 28 grams (gr)
 1 pound (lb) = 454 grams (gr) = 0.45 kg
 1 gram (gr) = 1,000 milligrams (mg)
 1,000 mg = 0.035 oz
 1 mg = 0.000035 oz

Conversions of Body Weight in Pounds (lb) to Body Weight in Kilograms (kg):

All the following calculations use a body weight of 100 pounds.

To calculate LD₅₀, first convert body weight in pounds to body weight in kilograms by multiplying weight in pounds by 0.454: 100 lb x 0.454 = 45.4 kg

Additional examples:

Body weight in lb:	25	50	75	100	150	200
Body weight in kg:	11.4	22.7	34.1	45.4	68.1	90.8

Next, multiply given LD₅₀ by body weight in kg (**Note:** LD₅₀ numbers are given by the manufacturer).

For example: LD₅₀ of **11 mg/kg** x 45.4 kg = 499.4 mg

Next, to convert milligrams (mg) to ounces (oz), multiply mg by 0.000035.

For example: 499.4 mg x 0.000035 = 0.017 oz

Table D-5.

LD₅₀ Figures Converted to Ounces for Three Commonly Used Products in Agriculture

	LD ₅₀	Body Weight in Pounds				
		30	60	100	150	200
		Ounces				
Insecticide methomyl	17	0.008	0.016	0.026	0.039	0.053
Herbicide Micro-Tech/Partner	1,800	0.9	1.7	2.8	4.3	5.7
Fungicide chlorothalonil	10,000	4.9	9.5	15.7	23.8	31.5

D Pesticide Safety

Pesticide Formulations

Commercial pesticides may be developed in many different formulations. Some are emulsifiable concentrates, flowables, wettable powders, dusts, and granules. After each pesticide recommendation in this publication, one of these formulations is presumed; however, unless stated to the contrary, equivalent rates of another formulation or concentration of that pesticide can be used.

In most cases, sprays rather than dusts are preferred for the control pests of vegetables. This is because sprays have produced better control and have resulted in less drift than dry particulates.

Table D-6 lists type class; use category; acute mammalian toxicity; reentry times; and toxicity to birds, fish, and bees for the pesticides recommended for use in this manual.

Table D-6. Acute Toxicity of Chemicals

Note: The Occupational Safety and Health Administration (OSHA) requires growers to keep on file Safety Data Sheets (SDS) for certain chemicals used during normal spray programs (Safety Data Sheets replaced Material Safety Data Sheets). **SDS sheets should be obtained from either your local pesticide dealer or directly from the chemical manufacturer.** Some labels carry technical assistance phone numbers that you can call for further information. Call this number to request a SDS sheet from the manufacturer.

-- = Data not available, * = Material covered under the Superfund Amendments and Reauthorization Act of 1986 (SARA) for storage notification.

Name ¹	Type ² Class	Use ³ Category	LD ₅₀ Values Mg/Kg ⁴		REI ⁵ (h)	Toxicity ⁶		
			Oral	Dermal		Bird	Fish	Bee
abamectin, Agri-Mek, ABBA, Epi-Mek, Temprano, Minecto Pro	I-FB	R	300	>1,800	12	N	M	H
ABBA, abamectin	I-FB	R	300	>1,800	12	N	M	H
Abound, azoxystrobin,	F	G	>2,000	>5,000	4	--	H	N
Accent Q, nicosulfuron	H	G	>5,000	>5,000	4	N	N	N
acephate, Orthene	I-OP	G	tech 980	>10,250	24	M	N	H
acetamiprid, Assail, Tristar	I	G	1,064	>2,000	12	N	N	M
acetochlor, Degree, Harness, Surpass	H	G	tech 4,124	tech >2,000	12	--	H	--
acetoxtradin + dimethomorph, Zampro	F	G	>500 - >2,000	>5,000	12	---	---	---
acibenzolar-S-methyl, Actigard, Blockade	B,F	G	--	--	12	N	M	N
Acramite, bifenazate	A	G	>5,000	>5,000	12	N	H	M
Actara, thiamethoxam	I-NN	G	>5,000	>2,000	12	N	N	H
Actigard, acibenzolar-S-methyl	B,F	G	--	--	12	N	M	H
Acuron, bicyclopyrone + mesotrione + s-metolachlor + atrazine	H	R-13	1,750	>5,000	24	--	--	--
Admire Pro, imidacloprid	I-NN	G	tech 450	>5,000	12	M	M	H
Agree, <i>Bacillus thuringiensis aizawai</i> + <i>kurstaki</i>	I-BT	G	see footnote 7		4	N	N	N
Agri-Fos, phosphite salts,	F	G			4	--	M	N
Agri-Mek, abamectin	I-FB	R	300	>1,800	12	--	M	H
Agri-Strep, streptomycin	B	G	9,000	--	12	--	--	--
Agri Tin, triphenyltin hydroxide	F	R	160	500	48	--	H	--
Aim, carfentrazone	H	G	5,143	>5,000	12	N	M	N
alachlor, Micro-Tech	H	R-12	1,800	--	12	N	N	N
Alcide, sodium chlorite	F	G	--	--	12	N	N	N
Aliette, fosetyl Al	F	G	tech 5,000	>2,000	12,24	N	N	N
Allegiance, metalaxyl	F	G	>2,900	>2,000	24	N	N	N
Altacor, chlorantraniliprole	I	G	>5,000	>5,000	4	--	--	--
Anthem Maxx, pyroxasulfone + fluthiacet	H	G	>5,000	>5,000	12	--	M	--
Apron, mefenoxam, metalaxyl	F	G	tech 669	>3,100	12	N	N	N
Aprovia Top, difenocoazole + benzovindiflpyr	F	G	1,750	>5,000	12	N	M	N
Armezon, topramezone	H	G	>2,000	>2,000	12	N	N	N
Asana XL, esfenvalerate	I-PY	R-12	458	>2,000	12	N	H	H
Assail, acetamiprid	I	G	1,064	>2,000	12	N	N	M
Assure II, quizalofop	H	G	1,210	--	12	N	N	N
Atrazine, atrazine	H	R-13	tech 1,780	7,500	12	S	S	N

Table continued on next page

Table D-6. Acute Toxicity of Chemicals - continued

Name ¹	Type ² Class	Use ³ Category	LD ₅₀ Values Mg/Kg ⁴		REI ⁵ (h)	Toxicity ⁶		
			Oral	Dermal		Bird	Fish	Bee
Avaunt, indoxacarb	I-CA	G	268	--	12	M	M	H
azadirachtin, Aza-Direct, Azatin, Ecozin, Neemix	IGR	G	>5,000	>2,000	12	--	H	N
Aza-Direct, azadirachtin	I	G	>5,000	>2,000	4	--	H	N
Azatin, azadirachtin	IGR	G	>5,000	>2,000	12	--	H	N
azoxystrobin, Abound, Dynasty, Quadris	F	G	>2,000	>5,000	4	--	H	N
azoxystrobin, benzovindiflupyr, Elatus	F	G	1,049	>2,000	12	--	M	--
azoxystrobin + chlorothalonil, Quadris opti	F	G	>2,000	>5,000	4	N	H	N
azoxystrobin + difenoconazole, Quadris Top	F	G	>2,000	>2,000	12	--	--	--
azoxystrobin + propiconazole, Quilt	F	G	1,750	>5,000	12	N	H	N
Aztec, cyfluthrin + tebufospyr	I	--	--	--	12	--	H	N
<i>Bacillus pumilus</i> GB34, Yield Shield	F-BT	G		NA	NA	NA	NA	NA
<i>Bacillus subtilis</i> GB03, Kodiak	F-BT	G		NA	4	NA	NA	NA
<i>Bacillus thuringiensis</i> , Biobit	I-BT	G	see footnote 7		4	N	N	N
Banvel, dicamba	H	G	2,629	>2,000	12,24	--	--	N
Basagran, bentazon	H	G	2,063	>6,050	12	S	N	N
Basicop, fixed copper ⁹	F	G	472	--	24	--	H	N
Battalion, deltamethrin	I	R	445	>2,000	12	--	H	H
Baythroid XL, beta-cyfluthrin	I	R	647	>2,000	12	--	H	H
Beleaf, flonicamid	I	G	>2,000	>2,000	12	--	N	L
bensulide, Prefar	H	G	tech 271-1,470	--	12	--	H	H
bentazon, Basagran	H	G	2,063	>6,050	12	S	N	N
benzovindiflupyr, azoxystrobin, Elatus	F	G	1,049	>2,000	12	--	M	--
benzovindiflupyr + difenoconazole, Aprovia Top	F	G	1,750	>5,000	12	N	M	N
Besiege, lambda-cyhalothrin + chlorantraniliprole	I	R-12	98.11	>5,000	24	--	H	H
beta-cyfluthrin, Baythroid XL	I	R	647	>2,000	12	--	H	H
beta-cyfluthrin + imidacloprid, Leverage 360	I	R	>1,044	>2,000	12	L	H	H
bicyclopyrone + mesotrione + s-metolachlor + atrazine, Acuron	H	R-13	1,750	>5,000	24	--	--	--
bifenthrin, Bifenture, Brigade, Capture LFR Fanfare, Sniper, Tundra	I-PY	R	262	>2,000	24	M	H	H
bifenthrin + imidacloprid, Brigadier	I	R	175	>5,000	12	--	H	H
Bifenthrin + zeta cypermethrin, Hero	I-PY	R-10,11	550	--	24	S	H	H
Bifenture, bifenthrin	I-PY	R	262	>2,000	24	M	H	H
bifenazate, Acramite, Floramite	A	G	>5,000	>5,000	12	N	H	M
Biobit, <i>Bacillus thuringiensis kurstaki</i>	I-BT	G	see footnote 7		4	N	N	N
Blackhawk, spinosad	I-ML	G	>5,000	>2,000	4	H	--	--
Blockade, acibenzolar-S-methyl	B,F	G	--	--	12	N	M	N
Blocker, PCNB	F	G	>5,050	>2,020	12	--	H	--
boscalid, Endura	F	G	>2,000	>2,000	12	--	--	--
Botran, dicloran	F	G	tech >5,000	--	12	S	M	N
Bravo, chlorothalonil	F	G	>10,000	>10,000	12	--	H	N
*Bravo 720, chlorothalonil	F	G	>10,000	>10,000	12	--	H	N
Bravo Ultrex, chlorothalonil	F	G	>10,000	>10,000	12	--	H	N
Brigade, bifenthrin	I-PY	R	262	>2,000	24	M	H	H
Brigadier, bifenthrin + imidacloprid	I	R	175	>5,000	12	--	H	H
bromoxynil, Maestro	H	G	tech 260	>2,000	12	H	H	H
buprofezin, Courier, Talus	IGR	G	>5,000	>2,000	12	--	--	--
Cabrio, pyraclostrobin	F	G	>500	>4,000	12	--	H	N
Callisto, mesotrione	H	G	>5,000	>5,000	12	N	N	N
Cannonball, fludioxonil	F	G	>5,000	>2,000	12	L	H	L
Caparol, promethryn	H	G	>5,000	>5,000	24	L	H	--
Captan 400, captan	F	G	9,000	--	96	S	H	N
*captan, Captan 400	F	G	9,000	--	96	S	H	N

Table continued on next page

D Pesticide Safety

Table D-6. Acute Toxicity of Chemicals - continued

Name ¹	Type ² Class	Use ³ Category	LD ₅₀ Values Mg/Kg ⁴		REI ⁵ (h)	Toxicity ⁶		
			Oral	Dermal		Bird	Fish	Bee
Captevate, fenhexamid + captan	F	G	>2,000	>5,000	24	N	H	N
*carbaryl, Sevin	I-CA	G	500	850	12	S	N	H
carfentrazone, Aim	H	G	5,143	>5,000	12	--	M	N
carfentrazone + sulfentrazone, Spartan Charge	H	G	5,000	>5,050	12	N	M	N
Champ, fixed copper ⁹	F	G	1,000	--	48	--	H	N
Champion, fixed copper ⁹	F	G	2,000	--	48	--	H	N
Chateau, flumioxazin	H	G	>5,000	>2,000	12	N	N	N
chemopodium ambrosioides, Requiem	I,A	G	>5,000	>5,000	4	--	--	--
chlorantraniliprole, Altacor, Coragen,	I	G	>5,000	>5,000	4	--	--	--
chlorantraniliprole + lambda cyhalothrin, Besiege, Voliam Xpress	I	R-12	98	>5,000	24	--	H	H
chlorantraniliprole, thiamethoxam, Durivo, Voliam Flexi	I-NN	G	>5,000	>5,000	12	--	--	H
chlorfonapyr, Pylon	A	G	560	--	12	--	H	H
chlorine, Clorox (bleach)	F	G	--	--	12	N	N	N
chloroneb	F	G	>5,000	>5,000	12	N	--	--
chloropicrin	F,N	R-3,10	250	--	72	--	H	N
*chlorothalonil, Bravo, Bravo 720, Bravo Ultrex, Echo, Equus, Ridomil Gold Bravo	F	G	>10,000	>10,000	12	--	H	L
chlorothalonil, oxathiapiprolin, Orondis Opti	F	G	>5,000	>2,000	12	--	--	--
chlorothalonil + zoxamide, Zing!	F	G	1,750 - 5,000	>5,000	12	M	N	N
*chlorpyrifos, Lorsban	I-OP	R	92-276	2,000	12,24	M	H	H
chlorpyrifos + lambda-cyhalothrin Cobalt Advanced	I	R	>50	>3,000	24	M	M	H
Clarity, dicamba	H	G	2,629	>2,000	12,24	--	--	N
clethodim, Select, Select Max	H	G	3,610	>5,000	24	L	M	L
clomazone, Command	H	G	1,369	>2,000	12	--	--	--
clopyralid, Spur, Stinger	H	G	>5,000	>2,000	12	--	N	N
Clorox (bleach), chlorine	F	G	--	--	12	N	N	N
Closer, sulfoxaflor	I	G	>5,000	>5,000	12	N	M	H
clothianidin, Poncho, Belay	I-NN	G	>5,000	>2,000	--	N	M	H
Cobalt Advanced, chlorpyrifos + lambda-cyhalothrin	I	R	>50	>3,000	24	M	M	H
Command, clomazone	H	G	tech 2,077	>2,000	12	--	N	N
Concur, imidacloprid	I-NN	G	tech 450	>5,000	12	M	M	H
Confirm, tebufenozide	I	G	>5,000	>5,000	4	L	H	M
Coniothyrium minitans, Contans	F	G	--	--	4	--	N	N
Conserve, spinosad	I-ML	G	>5,000	>2,000	4	H	--	--
Contans, Coniothyrium minitans	F	G	--	--	4	--	N	N
Copper-Count-N, fixed copper ⁹	F	G	--	--	12	--	H	N
copper, fixed ⁹	F	G	--	--	24	--	H	N
copper hydroxide, Ridomil Gold Copper, ManKocide	F	G	tech 669	>3,100	48	--	H	N
Coragen, chlorantraniliprole	I	G	>5,000	>5,000	4	--	--	--
Counter, terbufos	I-OP	R-1,2	tech 4.5	1.1	48	--	H	N
Courier, buprofezin	IGR	G	>5,000	>2,000	12	--	--	--
Cruiser, thiamethoxam	I-NN	G	5523	>2,000	12	N	N	H
Crymax, <i>Bacillus thuringiensis kurstaki</i>	I-BT	G	see footnote 7		4	N	N	N
cryolite, Kryocide, Prokil	I-IO	G	>5,000	--	12	N	N	N
Cuprofix Disperss, fixed copper	F	G	>2,000	>4,000	24	--	H	N
Curbit, ethalfluralin	H	G	>10,000	>10,000	12	--	H	N
Curzate, cymoxanil	F	G	433	>5,000	12	N	H	N
Cutlass, <i>Bacillus thuringiensis kurstaki</i>	I-BT	G	see footnote 7		4	N	N	N
cyantraniliprole, Exirel, Pro Verimark, Minto Pro	I	G	>5,000	>5,000	12	--	--	H
cyazofamid, Ranman	F	G	>5,000	>2,000	12	L	L	L

Table continued on next page

Table D-6. Acute Toxicity of Chemicals - continued

Name ¹	Type ² Class	Use ³ Category	LD ₅₀ Values Mg/Kg ⁴		REI ⁵ (h)	Toxicity ⁶		
			Oral	Dermal		Bird	Fish	Bee
*cycloate, Ro-Neet	H	G	3,160-4,640	--	12	--	M	N
cyflufenamid, Torino	F	G	>2,000	>2,000	4	--	M	--
cyfluthrin, Tombstone	I-PY	R	500	>5,000	12	M	H	H
cymoxanil, Curzate,	F	G	433	>5,000	12	N	H	N
cypermethrin, Ammo	I-PY	R	250	2,000	12	N	H	H
cyprodinil + fludioxonil, Switch	F	G	>5,000	>2,000	12	--	H	N
cyromazine, Trigard	IGR	R,G	3,387	>3,100	12	S	H	H
*Dacthal, DCPA	H	G	>10,000	>2,000	24	S	--	N
Danitol, fenproparthrin	I-PY	R	66	>2,000	24	H	H	H
DCP, dichloropropene	N	R(NJ),G	300	333	72	--	--	--
*DCPA, Dacthal	H	G	>10,000	>2,000	24	S	--	N
Deadline, metaldehyde	I-OT	G	630	--	12,24	H	N	N
Degree, acetochlor	H	R-13	>5,000	>5,000	12	--	--	--
deltamethrin, Battalion	I	R	445	>2,000	12	--	H	H
Devrinol, napropamide	H	G	>4,640	--	12	--	N	N
diazinon	I-OP	R-11	tech 300-400	3,600	12,24	H	H	H
dicamba, Banvel, Clarity	H	G	2,629	>2,000	12,24	--	--	N
dichloropropene + chloropicrin, Telone II, Telone C-35	F,N	R-3,10	127	423	72	H	N	--
dicloran, Botran	F	G	tech >5,000	--	12	S	M	N
dicofol, Kelthane, Kelthane MF	A	G	820-960	1,000 -1,230	12	M	H	N
difenoconazole+cyprodinil, Inspire Super	F	G	5,000	>5,000	12	--	H	--
difenoazole + benzovindiflupyr Aprovia Top	F	G	1,750	>5,000	12	N	M	N
*Dimate, dimethoate	I-OP	R(NJ),G	Tech 235	>400	48	H	H	H
dimethenamid, Outlook	H	G	849	>2000	12	--	--	--
*dimethoate, Dimate	I-OP	R(NJ),G	tech 235	>400	48	H	H	H
dimethomorph, Forum	F	G	3,900	>2,000	24	--	H	N
dimethomorph + acetotradin, Zampro	F	G	>500 - >2,000	>5,000	12	---	---	---
Dimetric, metribuzin	H	G	tech 2,000	20,000	12	--	N	N
dinotefuran, Safari, Venom, Scorpion	I	G	>5,000	>5,000	12	--	--	H
Dipel, <i>Bacillus thuringiensis kurstaki</i>	I-BT	G	see footnote 7		4	N	N	N
diquat, Reglone	H	G	886	>5,050	24	--	--	--
Discipline, bifentrin	I-PY	R	262	>2,000	24	M	H	H
Distance, pyriproxyfen	IGR	G	>5,000	>2,000	12	--	H	N
Dithane, mancozeb	F	G	11,200	15,000	24	--	H	N
diuron, Karmex	H	G	tech >5,000	>5,000	12	--	--	N
dodine, Syllit	F	G	1,000	>6,000	48	--	H	H
Dual Magnum, S-metolachlor	H	G	tech 2,780	>10,000	12	S	M	N
Durivo, chlorantraniliprole + thiamethoxam,	I-NN	G	>5,000	>5,000	12	--	--	H
Dynasty, azoxystrobin	F	G	>2,000	>5,000	4	--	H	N
EBDC, Potato Seed Treater	F	G	4,500	>5,000	24	N	H	N
Echo, chlorothalonil	F	G	>10,000	>10,000	12	--	H	N
Ecozin, azadirachtin	IGR	G	>5,000	>2,000	12	--	H	N
Elatas, azoxystrobin, benzovindiflupyr	F	G	1,049	>2,000	12	--	M	--
Elevate, fenhexamid	F	G	>5,000	>5,000	4	L	M	N
emamectin, Proclaim	I-FB	R	1,516	>2,000	48	N	H	H
Endura, boscalid	F	G	>2,000	>2,000	12	--	--	--
Entrust, spinosad	I-ML	G	>5,000	>2,000	4	H	--	M
Epi-Mek, abamectin	I-FB	R	300	>1,800	12	N	M	H
Eptam, EPTC	H	G	tech 1,630	--	12	--	H	H
EPTC, Eptam	H	G	tech 1,630	--	12	--	H	H
Equus, chlorothalonil	F	G	>10,000	>10,000	12	--	H	--
esfenvalerate, Asana XL	I-PY	R-12	458	>2,000	12	--	H	H
ethalfuralin, Curbit	H	G	>10,000	>10,000	12	--	H	N

Table continued on next page

D Pesticide Safety

Table D-6. Acute Toxicity of Chemicals - continued

Name ¹	Type ² Class	Use ³ Category	LD ₅₀ Values Mg/Kg ⁴		REI ⁵ (h)	Toxicity ⁶		
			Oral	Dermal		Bird	Fish	Bee
ethephon, Ethrel	PGR	G	4,229	--	48	--	--	N
ethoprop, Mocap	N	R-2	6.2	2.4	48	H	H	H
Ethrel, ethephon	PGR	G	4,229	--	48	--	--	N
etoxazole, Zeal	A	G	>5,000	>5,000	12	N	H	N
Evolve, thiophanate methyl + mancozeb + cymoxanil	F	G	>5,000	>2,000	24	N	H	N
Exirel, cyantraniliprole,	I	G	>5,000	>5,000	12	--	--	H
famoxodone + cymoxanil, Tanos	F	G	960	>2,000	12	--	H	--
Fanfare, bifenthrin	I-PY	R	262	>2,000	24	M	H	H
fenamidone, Reason	F	G	>5,000	>5,000	12	--	--	--
fenamiphos, NemaCur	N	R-2	tech 3	200	48	H	H	N
fenbutatin-oxide, Vendex	A	R	2,631	>2,000	48	M	M	N
fenhexamid, Elevate	F	G	>5,000	>5,000	4	L	M	N
fenhexamid + captan, Captevate	F	G	>2,000	>5,000	24	N	H	N
fenproparthrin, Danitol	I-PY	R	66	>2,000	24	H	--	H
fenpyroximate, Portal	I,A	G	810		12	--	H	N
fipronil, Regent	I	R	275	841	0	M	H	M
fixed copper ⁹ , Cuprofix Disperss	F	G	--	--	12,24, 48	--	H	N
Flint, trifloxystrobin	F	G	>5,000	>2,000	12	M	H	N
flonicamid, Beleaf	I	G	>2,000	>2,000	12	--	N	L
Floramite, bifenazate	A	G	>5,000	>5,000	12	N	H	N
Flouronil, mefenoxam + chlorothalonil	F	G	see footnote 10	--	48	--	--	--
fluthiacet, Cadet	H	G	2,537	2,020	12	--	M	--
Flutriafol, Topguard	F	G	>2,000	>2,000	12	--	--	--
*fluazifop, Fusilade DX	H	G	3,328	--	12	--	M	N
fluazinam, Omega	F	G	>5,000	>2,000	48	--	H	N
fluidioxonil, Cannonball, Maxim, Scholar	F	G	>5,000	>2,000	12	L	H	L
fluidioxonil + mancozeb, Maxim MZ	F	G	>5,000	>5,000	24	N	H	N
fluensulfone, Nimitz	N	G	>2,000	>2,000	--	M	N	N
flumioxazin, Chateau, Valor	H	G	>5,000	>2,000	12	N	N	N
fluopicolide, Presidio	F	G	>2,000	>4,000	12	L	H	L
fluopyram, Velum Prime	F	G	>2,000	>2,000	12	--	--	--
fluopyram, pyrimethanil, Luna Tranquility	F	G	>2,000	>2,000	12	--	--	--
fluopyram, tebuconazole, Luna Sensation	F	G	≤5,000	>2,000	12	--	M	--
fluroxypyr, Starane Ultra	H	G	>5,000	>5,000	24	--	M	--
flutolanil + mancozeb, MonCoat MZ	F	G	>5,000	>5,000	24	M	M	N
flutolanil, Moncut	F	G	>5,000	>5,000	12	N	H	N
fluxapyroxad, Priaxor	F	G	>500->2,000	>5,000	12	N	N	N
fluxapyroxad + pyraclostrobin, Merivon	F	G	>50 - >300	>5,000	12	N	M	N
Folicur, tebuconazole	F	G	3,743	2,011	12	H	H	N
fomesafen, Reflex	H	G	6,950	>1,000	24	N	N	N
Fontelis, penthiopyrad	F	G	>5,000	>5,000	12	H	L	L
Force, tefluthrin	I-PY	R	1,213	>2,000	0	N	H	N
Formula 40, 2,4-D (acid)	H	R(NJ),G	375	--	48	M	N	H
Forum, dimethomorph	F	G	3,900	>2,000	24	--	H	N
fosetyl Al, Aliette	F	G	5,000	>2,000	12,24	N	N	N
Fulfill, pymetrozine	I-OT	G	>5,000	>2,000	12	N	N	N
Fusarex, TCNB	GR	G	--	--	--	--	--	--
*Fusilade DX, fluazifop	H	G	2,712	>2,420	12	--	M	N
gamma-cyhalothrin, Cobalt, Consero, Proaxis,	I-PY	R-12	>2,500	>5,000	24	N	H	H
Gaucho, imidacloprid	I-NN	G	tech 450	>5,000	12	M	M	H
Gavel, zoxamide + mancozeb	F	G	--	--	48	--	M	--
Gem, trifloxystrobin	F	G	5,050	>2,000	12	--	H	N
gibberellic acid, GibGro, ProGibb	PGR	G	1,000-25,000	--	4	--	N	N

Table continued on next page

Table D-6. Acute Toxicity of Chemicals - continued

Name ¹	Type ² Class	Use ³ Category	LD ₅₀ Values Mg/Kg ⁴		REI ⁵ (h)	Toxicity ⁶		
			Oral	Dermal		Bird	Fish	Bee
GibGro, gibberellic acid	PGR	G	1,000-25,000	--	4	--	N	N
Glory, metribuzin	H	G	tech 2,000	20,000	12	--	N	N
glufosinate, Liberty 280	H	G	>300-<2,000	1,400	12	--	--	--
glyphosate, Roundup	H	G	>5,000	>5,000	24	N	N	N
Goal, oxyfluorfen	H	G	tech >5,000	>10,000	24	--	H	N
GoalTender, oxyfluorfen	H	G	tech >5,000	>10,000	24	--	H	N
Gramoxone, paraquat	H	R-1,8	150	--	12,48	M	N	N
Guthion, azinphos-methyl	I-OP	R-1,2,3, 8,10,12	tech 10	200	48	M	H	H
halosulfuron, Permit, Sandea	H	G	1,287	>5,000	12	--	N	N
Harness, acetochlor	H	G	1,849	>5,000	12	--	H	--
harpin protein, Messenger	F	G	>5,000	>6,000	4	--	N	N
Headline, pyraclostrobin	F	G	>500	>4,000	12	--	H	N
Hero, zeta cypermethrin+bifenthrin	I-PY	R-10,11	550	--	24	S	H	H
hexythiazox, Savey	A	G	>5,000	>5,000	12	--	H	N
imazamox, Raptor	H	G	>5,000	>4,000	4	N	N	N
imazethapyr, Pursuit	H	G	>5,000	>2,000	12,24	--	N	N
Imidan, phosmet	I-OP	R(NJ),G	tech 147-316	>4,640	24	S	H	H
imidacloprid, Admire, Admire Pro, Concur, Gaucho, Lattitude, Marathon	I-NN	G	tech 450	>5,000	12	M	M	H
imidacloprid, beta-cyfluthrin, Leverage 360	I	R	>1,044	>2,000	12	L	H	H
Impact, topramezone	H	G	>2,000	>2,000	12	N	N	N
Incite, piperonyl butoxide	I-OT	G	>7,500	--	12	N	N	N
indoxacarb, Avaunt	I	G	268	--	12	M	M	H
Inspire Super, difenoconazole + cyprodinil	F	G	5,000	>5,000	12	--	H	--
iron phosphate, Sluggo	M	G	>5,000	>5,000	0	--	--	--
insecticidal soap, M-Pede	I-SO	G	16,900	--	12	N	N	N
Intrepid, methoxyfenozide	I	G	>5,000	>2,000	4	--	N	N
*iprodione, Rovral	F	G	>4,400	>2,000	12	--	S	N
Javelin, <i>Bacillus thuringiensis kurstaki</i>	I-BT	G	see footnote 7		4	N	N	N
K-Pam, metam potassium	F	G	630	>1,000	48	H	H	N
Karmex, diuron	H	G	tech >5,000	>5,000	12	N	N	N
Kelthane, Kelthane MF, dicofol	A	G	570-595	>5,000	12	M	H	N
Kerb, pronamide	H	R-5	tech 8,350	>3,160	12	--	N	N
Ketch, <i>Bacillus thuringiensis aizawai</i>	I-BT	G	see footnote 7		4	N	N	N
Knack, pyriproxyfen	IGR	G	>5,000	>2,000	12	--	H	N
Kocide, fixed copper ⁹	F	G	1,000	--	12,48	M	H	N
Kodiak, <i>Bacillus subtilis</i> GB03	F-BT	G		NA	NA	NA	NA	NA
Kontos, spirotetramat	I	G	>2000	>4000	24	N	N	L
Kryocide, cryolite	I-IO	G	>5,000	--	12	N	N	N
Lambda cyhalothrin, Lambda-Cy, Lambda T, Silencer, Warrior II	I-PY	R	tech 79	632	24	M	H	H
lambda-cyhalothrin, chlorpyrifos, Cobalt Advanced,	I	R	>50	>3,000	24	M	M	H
Lambda-Cy, lambda cyhalothrin	I-PY	R	tech 79	632	24	M	H	H
lambda-cyhalothrin+chlorantraniliprole, Besiege, Voliam Xpress	I	R-12	98.11	>5,000	24	--	H	H
Lambda T, lambda cyhalothrin	I-PY	R	tech 79	632	24	M	H	H
Lannate, methomyl	I-CA	R-8,10	17	5,880	48	H	H	H
Lattitude, imidacloprid	I-NN	G	tech 450	>5,000	12	M	M	H
Laudis, tembotrione	H	G	1,750	>5,000	12	--	--	--
Leverage 360, imidacloprid + beta-cyfluthrin,	I	R	>1,044	>2,000	12	L	H	H
Lexar, mesotrione + s-metolachlor + atrazine	H	R-13	4,144	>5,000	24	--	--	--
Liberty 280, glufosinate	H	G	>300-<2000	1,400	12	--	--	--
lindane	I-CH	R-5	88-125	1,000	12,24	M	M	N

Table continued on next page

D Pesticide Safety

Table D-6. Acute Toxicity of Chemicals - continued

Name ¹	Type ² Class	Use ³ Category	LD ₅₀ Values Mg/Kg ⁴		REI ⁵ (h)	Toxicity ⁶		
			Oral	Dermal		Bird	Fish	Bee
Linex, linuron	H	G	tech 4,000	--	24	--	S	N
linuron, Linex, Lorox	H	G	tech 4,000	--	24	--	S	N
Lorox, linuron	H	G	tech 4,000	--	24	--	S	N
*Lorsban, chlorpyrifos	I-OP	R	92-276	2,000	12,24	M	H	H
Lumax, mesotrione + s-metolachlor + atrazine	H	R-13	3,129	>5,000	24	--	--	--
Luna Experience, tebuconazole	F	G	≤5,000	>2,000	12	--	M	--
Luna Sensation, fluopyram, tebuconazole	F	G	≤5,000	>2,000	12	--	M	--
Luna Tranquility, fluopyram, pyrimethanil	F	G	>2,000	>2,000	12	--	--	--
Maestro, bromoxynil	H	G	tech 260	>2,000	12	H	H	H
malathion	I-OP	G	tech 5,500	>2,000	12	M	H	H
*mancozeb, Acrobat MZ, Curzate, Dithane, Manex II, Manex, ManKocide, Penncozeb, Ridomil Gold MZ	F	G	11,200	15,000	24	--	H	N
mancozeb + copper hydroxide, ManKocide	F	G	see footnote 10			N	H	N
mandipropamid, Revus	F	G	>5,000	>5,000	12		H	
mandipropamid + difenoconazole, Revus Top	F	G	2,958	>5,000	12	L	H	M
mandipropamid, oxathiapiprolin, Orondis Ultra	F	G	>5,000	>5,000	4	--	--	--
maneb, Manex	F	G	tech 7,990	>5,000	24	--	H	N
Manex, maneb	F	G	tech 7,990	>5,000	24	--	H	N
Manex II, mancozeb	F	G	11,200	>15,000	24	--	H	N
ManKocide, mancozeb + copper hydroxide	F	G	see footnote 10		48			
Marathon, imidacloprid	I-NN	G	Tech 450	>5,000	12	M	M	H
Matrix, rimsulfuron	H	G	>5,000	>2,000	4	N	L	L
Maxim, fludioxonil	F	G	>5,000	>2,000	12	L	H	L
Maxim MZ, fludioxonil + mancozeb	F	G	>5,000	>5,000	24	N	H	N
*MC-2, MC-33, methyl bromide	F,H,N	R-8	see footnote 8		48	--	--	N
mefenoxam, Apron, Ridomil Gold, Orondis Gold, Ultra Flourish	F	G	--	--	--	--	H	N
mefenoxam + azoxystrobin, Uniform	F	G	1,459	>5,000	0	--	--	--
mefenoxam + chlorothalonil, Ridomil Gold Bravo, Flouronil	F	G	see footnote 10					
mefenoxam + copper hydroxide, Ridomil Gold Copper	F	G	see footnote 10					
mefenoxam + mancozeb, Ridomil Gold MZ	F	G	>5,000	>2,000	48	N	H	N
mefenoxam + PCNB, Ridomil Gold PCNB	F	G	>5,050	>2,020	48	N	H	N
Mertect, thiabendazole	F	G	>5,000	>5,050	12	N	H	N
mesotrione, Callisto	H	G	>5,000	>5,000	12	N	N	N
mesotrione + s-metolachlor, Zemax	H	G	>5,000	>5,050	24	--	--	--
mesotrione + s-metolachlor + atrazine, Lexar	H	R-13	4,144	>5,000	24	--	--	--
mesotrione + s-metolachlor + atrazine, Lumax	H	R-13	3,129	>5,000	24	--	--	--
Messenger, harpin protein	F	G	>5,000	>6,000	4	--	N	N
Merivon, fluxapyroxad + pyraclostrobin	F	G	>50 - >300	>5,000	12	N	M	N
metalaxyl, Allegiance, Apron, MetaStar	F	G	tech 669	>3,100	12	N	N	N
metaldehyde, Deadline	I-OT		630	--		H	N	N
metam potassium, K-Pam	F	G	630	>1,000	48	H	H	N
metam-sodium, Vapam HL	N	G	1,891	>3,074	48	--	H	N
MetaStar, metalaxyl	F	G	tech 669	>3,100	12	N	N	N
*Metasystox-R, oxydementon methyl	I-OP	R	tech 50	150	48	--	H	H
metconazole, Quash	F	G	1,750	>5,000	12	--	--	--
methomyl, Lannate	I-CA	R-8,10	17	5,880	48	H	H	H
methoxyfenozide, Intrepid	I	G	>5,000	>2,000	4	--	N	N
*methyl bromide, MC-2, MC-33, Terr-O-Gas 67	F,H,N	R-8	see footnote 8		48	--	--	N
methyl iodide, Midas	F, H, I	--	--	--	--	--	--	--
metiram, Polyram	F	G	>5,000	>2,000	24	N	H	N
metrafenone, Vivando	F	G	>5,000	>5,000	12	--	M	--

Table continued on next page

Table D-6. Acute Toxicity of Chemicals - continued

Name ¹	Type ² Class	Use ³ Category	LD ₅₀ Values Mg/Kg ⁴		REI ⁵ (h)	Toxicity ⁶		
			Oral	Dermal		Bird	Fish	Bee
metribuzin, Glory, TriCor, Dimetric	H	G	tech 1,100-2,300	>20,000	12	--	M	N
Mettle, tetraconazole	F	G	>4,090	>2,000	12	--	L	--
Micro-Tech, alachlor	H	R-12	930-1,350	--	12	S	M	N
Midas, methyl iodide	F, H, I	--	--	--	--	--	--	--
Minecto Pro, cyantraniliprole + abamectin	I	R-10,12	451.1	>2,000	12	--	H	H
Mocap, ethoprop	N	R-2	61.5	2.4	48	H	H	H
MonCoat MZ, flutolanil+mancozeb	F	G	>5,000	>5,000	24	M	M	N
Moncut, flutolanil	F	G	>5,000	>5,000	12	N	H	N
Movento, spirotetramat	I	G	>2000	>4000	24	N	N	L
M-Pede, insecticidal soap	I-SO	G	16,900	--	12	N	N	N
Mustang Maxx, zeta-cypermethrin	I-PY	R-10,11	310	>5,000	12	--	H	H
MCPB, Thistrol	H	G	5,000	>5,000	24	--	--	--
myclobutanil, Nova, Rally	F	G	1,600	>5,000	24	--	N	N
napropamide, Devrinol	H	G	>4,640	--	12	--	N	N
Neemix, azadirachtin	IGR	G	>5,000	>2,000	12	--	H	N
Nemacur, fenamiphos	N	R-2	tech 3	200	48	H	H	N
neem oil, Trilogy	F,A,I	G	>5 g	--	4	--	H	H
nicosulfuron, Accent Q	H	G	>5,000	>5,000	4	N	N	N
Nimitz, fluensulfone	N	G	>2,000	>2,000	--	M	N	N
norflurazon, Solicam	H	G	>8,000	>20,000	12	N	M	N
Nova, myclobutanil	F	G	1,600	>5,000	24	--	N	N
Novodor, <i>Bacillus thuringiensis tenebrionis</i>	I-BT	G	see footnote 7		4	N	N	N
novaluron, Rimon	I-IGR	G	3,914	>2,000	12	N	H	H
Noxfire, rotenone	I-BO	G	132-1,500	--	12,24, 48	S	H	N
NPV, Spod-X	I	G	--	--	4	--	--	--
NutriPhyte, phosphite salts	F	G			4	--	M	N
Oberon, spiromesifen	IGR	G	>2,000	>4,000	12	--	H	--
Omega, fluazinam	F	G	>5,000	>2,000	48	--	H	N
Orondis Gold, mefenoxam	F	G	550	>2,000	48	--	--	--
Orondis Opti, chlorothalonil, oxathiapiprolin	F	G	>5,000	>2,000	12	--	--	--
Orondis Ultra, oxathiapiprolin, mandipropamid	F	G	>5,000	>5,000	4	--	--	--
Orthene, acephate	I-OP	G	tech 980	>10,250	24	M	N	H
Outlook, dimethenamid	H	G	849	>2000	12	--	--	--
oxamyl, Vydate L	I,N-CA	R	37	2,960	48	H	H	H
oxathiapiprolin, mandipropamid, Orondis Ultra	F	G	>5,000	>5,000	4	--	--	--
oxyfluorfen, Goal, GoalTender	H	G	tech >5,000	>10,000	24	--	H	N
parafinic oil	A	G	22 g	--	4	--	--	--
paraquat, Gramoxone	H	R-1,8	150	--	12,48	M	N	N
PBO (piperonyl butoxide)	I-OT	G	>7,500	--	12	N	N	N
PCNB, Terraclor, Blocker	F	G	tech 1,700-5,000	2,000 -4,000	12,24	S	H	H
pendimethalin, Prowl, Prowl H2O	H	G	1,250	>5,000	12,24	--	M	N
Penncozeb, mancozeb	F	G	11,200	>15,000	24	--	H	N
penhiopyrad, Fontelis	F	G	>5,000	>5,000	12	H	L	L
permethrin, Perm-Up	I-PY	R-12	tech >4,000	>4,000	24	N	H	H
Permit, halosulfuron	H	G	1,287	>5,000	12	--	N	N
Perm-Up, permethrin	I-PY	R-12	tech >4,000	>4,000	24	N	H	H
*phenmedipham, Spin-Aid	H	G	>8,000	>4,000	24	--	M	N
*phorate, Thimet	I-OP	R-2,10,11	tech 2-4	20-30	48	H	H	H
phosmet, Imidan	I-OP	R(NJ),G	tech 147-316	>4,640	24	S	H	H
phosphite salts, Phostrol, ProPhyt, Agri-Fos, NutriPhyte, Rampart	F	G	>5,000	>5,000	4	N	H	N
Phostrol, phosphite salts	F	G	>5,000	>5,000	4	N	H	N

Table continued on next page

D Pesticide Safety

Table D-6. Acute Toxicity of Chemicals - continued

Name ¹	Type ² Class	Use ³ Category	LD ₅₀ Values Mg/Kg ⁴		REI ⁵ (h)	Toxicity ⁶		
			Oral	Dermal		Bird	Fish	Bee
Platinum, thiamethoxam	I-NN	G	>5,000	>2,000	12	--	M	L
Poast, sethoxydim	H	G	3,200-3,500	>5,000	12,24	S	M	S
Polyram, metiram	F	G	>5,000	>2,000	24	N	H	N
Poncho, clothianidin	I-NN	G	>5,000	>2,000	--	N	M	H
Portal, fenpyroximate	I,A	G	810		12	--	H	N
Potato Seed Treater, EBDC	F	G	4,500	>5,000	24	N	H	N
Prefar, bensulide	H	G	tech 271-1,470	--	12	--	H	H
Presidio, fluopicolide	F	G	>2,000	>4,000	12	L	H	L
Previcur Flex, propamocarb hydrochloride	F	G	2,900	>3,000	12	--	N	N
Priaxor, fluxapyroxad	F	G	>500->2,000	>5,000	12	N	H	N
Pristine, pyraclostrobin + boscalid	F	G	>2,000	>2,000	12	--	H	--
Proaxis, gamma-cyhalothrin	I-PY	R-12	>2,500	>5,000	24	N	H	H
Proclaim, emamectin	I-FB	R	1,516	>2,000	48	N	H	H
Procare, triflumizole	F	G	2,230	>2,000	12	--	H	N
ProGibb, gibberellic acid	PGR	G	1,000-25,000	--	4	--	N	N
Pro-Gro, thiram + carboxin	F	G	>2,000	>2,000	--	N	H	N
Prokil, cryolite	I-IO	G	>5,000	--	12	N	N	N
Proline, prothioconazole	F	G	2,000-5,000	>5,000	12	--	--	--
Prolong, <i>Bacillus thuringiensis kurstaki</i>	I-BT	G	see footnote 7		4	N	N	N
pronamide, Kerb	H	R-5	tech 8,350	5,620	12	--	N	N
propamocarb hydrochloride, Previcur Flex	F	G	2,900	>3,000	12	--	N	N
promethryn, Caparol	H	G	>5,000	>5,000	24	L	H	--
ProPhyt, phosphite salts	F	G	>5,000	>5,000	4	N	H	N
*propiconazole, Tilt	F	G	1,517	>4,000	24	--	H	N
prothioconazole, Proline	F	G	2,000-5,000	>5,000	12	--	--	--
ProVerimark, cyantraniliprole	I	G	>5,000	>5,000	12	--	--	H
Prowl, Prowl H2O, pendimethalin	H	G	3,956	2,200	12,24	--	M	N
Pursuit, imazethapyr	H	G	>5,000	>2,000	12,24	--	N	N
PyGanic EC 5.0 II, pyrethrins	I	G	>2,000	>2,000	12	--	M	M
Pylon, chlorphanapyr	A	G	560	--	12	--	H	H
pymetrozine, Fulfill	I-OT	G	>5,000	>2,000	12	N	N	N
pyraclostrobin, Cabrio, Headline	F	G	>500	>4,000	12	--	H	N
pyraclostrobin + boscalid, Pristine	F	G	>2,000	>2,000	12	--	H	--
pyraclostrobin + fluxapyroxad, Merivon	F	G	>50 - >300	>5,000	12	N	M	N
Pyrellin, pyrethrins, rotenone	I	G	1,620	--	12	--	H	--
pyrethrins, PyGanic EC 5.0 II	I	G	>2,000	>2,000	12	--	M	M
pyrethrum	I-BO	G	1,500	>1,800	12	N	H	M
pyrimethanil, Scala	F	G	4,505	>5,000	12	--	M	--
pyrimethanil, fluopyram, Luna Tranquility	F	G	>2,000	>2,000	12	--	--	--
pyriproxyfen, Distance, Knack	IGR	G	>5,000	>2,000	12	--	H	N
pyroxasulfone, Zidua	H	G	>2,000	>2,000	12	--	H	--
pyroxasulfone + fluthiacet, Anthem Maxx	H	G	>5,000	>5,000	12	--	M	--
Quadris, azoxystrobin	F	G	>2,000	>5,000	4	--	H	N
Quadris Opti, azoxystrobin + chlorothalonil	F	G	1,750	>5,000	12	N	H	N
Quadris Top, azoxystrobin + difenoconazole	F	G	>2,000	>2,000	12	--	--	--
Quash, metconazole	F	G	1,750	>5,000	12	--	--	--
Quilt, azoxystrobin + propiconazole	F	G	1,750	>5,000	12	N	H	N
Quintec, quinoxyfen	F	G	>2,000	>2,000	12	N	H	--
quinoxifen, Quintec	F	G	>2,000	>2,000	12	N	H	--
quizalofop, Assure II, Targa	H	G	1,210	--	12	N	N	N
Radiant, spinetoram	I	G	>5,000	>5,000	4	N	H	H
Rally, myclobutanil	F	G	1,600	>5,000	24	--	N	N
Ranman, cyazofamid	F	G	>5,000	>2,000	12	L	L	L
Rampart, phosphite salts	F	G	--	--	4	N	H	N
Raptor, imazamox	H	G	>5,000	>4,000	4	N	N	N

Table continued on next page

Table D-6. Acute Toxicity of Chemicals - continued

Name ¹	Type ² Class	Use ³ Category	LD ₅₀ Values Mg/Kg ⁴		REI ⁵ (h)	Toxicity ⁶		
			Oral	Dermal		Bird	Fish	Bee
Raven, <i>Bacillus thuringiensis tenebrionis</i>	I-BT	G	see footnote 7		4	N	N	N
Reason, fenamidone	F	G	>5,000	>5,000	12	--	--	--
Reflex, fomesafen	H	G	6,950	>1,000	24	N	N	N
Regent, fipronil	I	R	275	841	0	M	H	M
Requiem, chemopodium ambrosioides	I,A	G	>5,000	>5,000	4	--	--	--
Reglone, diquat	H	G	886	>5,050	24	--	--	--
Revus, mandipropamid	F	G	>5,000	>5,000	12	--	H	--
Revus Top, mandipropamid + difenoconazole	F	G	2,958	>5,000	12	L	H	M
Ridomil Gold, mefenoxam	F	G	1,172	2,020	48	N	N	N
Ridomil Gold Bravo, mefenoxam + chlorothalonil	F	G	see footnote 10		12			
Ridomil Gold Copper, mefenoxam + copper hydroxide	F	G	see footnote 10		48			
Ridomil Gold MZ, mefenoxam + mancozeb	F	G	>5,000	>2,000	48	N	H	N
Ridomil Gold PCNB, mefenoxam + PCNB	F	G	>5,050	>2,020	48	N	H	N
Rimon, novaluron	I-IGR	G	3,914	>2,000	12	N	H	H
*Ro-Neet, cycloate	H	G	tech 2,000-4,100	--	12	--	M	N
Rotacide, rotenone	I-BO	G	132-1,500	--	24	S	H	N
*rotenone, Rotenox, Rotacide, Noxfire	I-BO	G	132-1,500	--	12,24, 48	S	H	N
Rotenox, rotenone	I-BO	G	132-1,500	--	48	S	H	N
Roundup, glyphosate	H	G	>5,000	>5,000	24	N	N	N
*Rovral, iprodione	F	G	>4,400	>2,000	12	--	S	N
Safari, dinotefuran	I	G	>5,000	>5,000	12	--	--	H
saflufenacil, Sharpen	H	G	>2,000	>5,000	12	--	--	--
Sandea, halosulfuron	H	G	1,287	>5,000	12	--	N	N
Savey, hexythiazox	A	G	>5,000	>5,000	12	--	H	N
Scala, pyrimethanil	F	G	4,505	>5,000	12	--	M	--
Scholar, fludioxonil	F	G	>5,000	>5,050	post harvest	L	H	--
Select, Select Max, clethodim	H	G	3,610	>5,000	24	L	M	L
sethoxydim, Poast	H	G	2,676-3,125	>5,000	12,24	S	M	S
Sevin, carbaryl	I-CA	G	tech 283	>2,000	12	S	N	H
Sharpen, saflufenacil	H	G	>2,000	>5,000	12	--	--	--
Silencer, lambda cyhalothrin	I-PY	R	tech 79	632	24	M	H	H
*Sinbar, terbacil	H	G	5,000-7,500	--	12	--	N	N
Sluggo, iron phosphate	M	G	>5,000	>5,000	0	--	--	--
S-metolachlor, Dual Magnum	H	G	tech 2,780	10,000	12	S	M	N
Sniper, bifenthrin	I-PY	R	262	>2,000	24	M	H	H
sodium chlorite, Alcide	F	G	--	--	12	N	N	N
SoilGard, streptomycetes	F	G	--	--	12	N	N	N
Solicam, norflurazon	H	G	>8,000	>20,000	12	N	M	N
Spartan Charge, sulfentrazone + carfentrazone	H	G	5,000	>5,050	12	N	M	N
*Spin-Aid, phenmedipham	H	G	>8,000	>4,000	24	--	M	N
spinetoram, Radiant	I	G	>5,000	>5,000	4	N	H	H
spinosad, Blackhawk, Consero, Conserve, Entrust,	I-ML	G	>5,000	>2,000	4	H	--	M
spiromesifen, Oberon	IGR	G	>2000	>4,000	12	--	H	--
spirotetramat, Kontos, Movento	I	G	>2000	>4000	24	N	N	L
Stinger, clopyralid	H	G	>5,000	>2,000	12	--	N	N
Spod-X, NPV	I	G	--	--	4	--	--	--
Spur, clopyralid	H	G	>5,000	>2,000	12	--	N	N
Stratego, trifloxystrobin + propiconazole	F	G	4,800	>5050	12	L	H	--
Starane Ultra, fluroxypyr	H	G	>5,000	>5,000	24	--	M	--

Table continued on next page

D Pesticide Safety

Table D-6. Acute Toxicity of Chemicals - continued

Name ¹	Type ² Class	Use ³ Category	LD ₅₀ Values Mg/Kg ⁴		REI ⁵ (h)	Toxicity ⁶		
			Oral	Dermal		Bird	Fish	Bee
Strategy, ethalfluralin + clomazone	H	G	>5,050	>5,050	24	--	H	N
streptomycetes, SoilGard	F	G	--	--	12	N	N	N
streptomycin, Agri-Mycin-17, Agri-Strep	B	G	9,000	--	12	--	--	--
sulfentrazone, Spartan, Zeus	H	G	1,750	>5,000	12	L	L	--
sulfentrazone + carfentrazone, Spartan Charge	H	G	5,000	>5,050	12	N	M	N
sulfoxaflor, Closer, Transform	I	G,R	>5,000	>5,000	24	S	H	H
sulfur	A,F, I-IO	G	>5,000	>5,000	12,24, 48	N	N	N
Super Cu, fixed copper ⁹	F	G	--	--	12	--	H	N
Super Tin, triphenyltin hydroxide	F	R	160	500	48	--	H	--
Surpass, acetochlor	H	G	1,415	>2,240	12	--	H	--
Switch, cyprodinil + fludioxonil	F	G	>5,000	>2,000	12	--	H	N
Syllit, dodine	F	G	1,000	>6,000	48	--	H	H
TCNB, Fusarex	GR	G	--	--	--	--	--	--
Talus, buprofenzin	IGR	G	>5,000	>2,000	12	--	--	--
Tanos, famoxodone + cymoxanil	F	G	960	>2,000	12	--	H	--
Targa, quizalofop	H	G	1,210	--	12	N	N	N
tebuconazole, Folicur, Luna Experience, Tebuzol	F	G	3,743	2,011	12	H	H	N
tebuconazole, fluopyram, Luna Sensation	F	G	≤5,000	>2,000	12	--	M	--
tebufenozide, Confirm	I	G	>5,000	>5,000	4	L	H	M
Tebuzol, tebuconazole	F	G	3,743	2,011	12	H	H	N
Tedion, tetradifon	A	G	>10,000	>10,000	12	--	--	--
tefluthrin, Force	I-PY	R	1,213	>2,000	0	N	H	N
Telone II, dichloropropene + chloropicrin	F,N	R-3,10	127	423	72	H	N	--
Telone C-35, dichloropropene + chloropicrin	F,N	R-3,10	127	423	72	H	N	--
tembotrione, Laudis	H	G	1,750	>5,000	12	--	--	--
Temprano, abamectin	I-FB	R	300	>1,800	12	N	M	H
Tenn-Cop, fixed copper ⁹	F	G	--	--	24	--	H	N
*terbacil, Sinbar	H	G	5,000-7,500	--	12	--	N	N
terbufos, Counter	I-OP	R-1,2	tech 4.5	1.1	48	--	H	N
Terraclor, PCNB	F	G	tech 1,700-5,000	2,000- 4,000	12,24	S	H	N
*Terr-O-Gas 67, methyl bromide	F,H,N	R-8	see footnote 8		48	--	--	N
tetraconazole, Mettle	F	G	>4,090	>2,000	12	--	L	--
tetradifon, Tedion	A	G	>10,000	>10,000	12	--	--	--
*thiabendazole, Mertect	F	G	>5,000	>5,050	12	N	H	N
thiamethoxam, Actara, Cruiser, Durivo Endigo, Platinum, Voliam flexi	I-NN	G	>5,000	>2,000	12	N	N	L
*Thimet, phorate	I-OP	R-2,10,11	tech 2-4	20-30	48	H	H	H
thiophanate-methyl, Topsin M	F	G	7,500	--	12	--	S	N
thiophanate-methyl + mancozeb, Tops MZ	F	G	>5,050	>2,020	24	N	H	N
thiophanate methyl + mancozeb + cmoxanil, Evolve	F	G	>5,000	>2,000	24	N	H	N
thiram, Thylate, 42-S Thiram	F	G	tech 1,000	>5,000	12	S	H	N
thiram + carboxin, Pro-Gro	F	G	>2,000	>2,000		N	H	N
Thylate, thiram	F	G	tech 1,000	>5,000	12	S	H	N
Thistrol, MCPB	H	G	5,000	>5,000	24	--	--	--
*Tilt, propiconazole	F	G	1,517	>4,000	24	--	H	N
tolfenpyrad, Torac	I	G	102	>2,000	12	--	H	H
Tombstone, cyfluthrin	I-PY	R	500	>5,000	12	M	H	H
topramezone, Armezon, Impact	H	G	>2,000	>2,000	12	N	N	N
Tops MZ, thiophanate-methyl + mancozeb	F	G	>5,050	>2,020	24	N	H	N
Topsin M, thiophanate-methyl	F	G	7,500	--	12	--	S	N
Torac, tolfenpyrad	I	G	102	>2,000	12	--	H	H
Transform, sulfoxaflor	I	R	>5,000	>5,000	24	S	H	H

Table continued on next page

Table D-6. Acute Toxicity of Chemicals - continued

Name ¹	Type ² Class	Use ³ Category	LD ₅₀ Values Mg/Kg ⁴		REI ⁵ (h)	Toxicity ⁶		
			Oral	Dermal		Bird	Fish	Bee
Topguard, flutriafol	F	G	>2,000	>2,000	12	--	--	--
Torino, cyflufenamid	F	G	>2,000	>2,000	4	--	M	--
Treflan, trifluralin	H	G	>10,000	--	12,24	N	M	N
Tri-Basic Copper Sulfate, fixed copper ⁹	F	G	472	--	24	--	H	N
TriCor, metribuzin	H	G	tech 2,000	20,000	12	--	N	N
trifloxystrobin, Gem, Flint	F	G	>5,000	>2,000	12	--	H	N
trifloxystrobin + metalaxyl, Trilex AL	F	G	>5,000	>5,000	24	N	H	N
trifloxystrobin + propiconazole, Stratego	F	G	4,800	>5,050	12	L	H	--
triflumizole, Procure	F	G	2,230	>2,000	12	--	H	N
trifluralin, Treflan	H	G	>10,000	--	12,24	N	M	N
Trigard, cyromazine	IGR	R,G	3,387	3,100	12	S	H	H
Trilex AL, trifloxystrobin + metalaxyl	F	G	>5,000	>5,000	24	N	H	N
Trilogy, neem oil	F,A,I	G	>5 g	--	4	--	H	H
triphenyltin hydroxide, Super Tin, Agri Tin	F	R	160	500	48	--	H	--
Tristar, acetamiprid	I	G	1,064	>2,000	12	N	N	M
Tundra, bifenthrin	I-PY	R	262	>2,000	24	M	H	H
Ultra Flourish, mefenoxam	F	G	--	--	--	--	H	N
Uniform, mefenoxam + azoxystrobin	F	G	1,459	>5,000	0	--	--	--
Valor, flumioxazin	H	G	>5,000	>2,000	12	N	N	N
Vapam HL, metam-sodium	N	G	1,891	>3,074	48	--	H	N
Velum Prime, fluopyram	F	G	>2,000	>2,000	12	--	--	--
Vendex, fenbutatin-oxide	A	R	2,631	>2,000	48	M	M	N
Venom, dinotefuran	I	G	>5,000	>5,000	12	--	--	H
Vivando, metrafenone	F	G	>5,000	>5,000	12	--	M	--
Voliam Flexi, chlorantraniliprole, thiamethoxam	I-NN	G	>5,000	>5,000	12	--	--	H
Voliam Xpress, lambda-cyhalothrin + chlorantraniliprole	I	R-12	98.11	>5,000	24	--	H	H
Vydate L, oxamyl	LN-CA	R	37	2,960	48	H	H	H
Warrior, lambda cyhalothrin	I-PY	R	tech 79	632	24	M	H	H
XenTari, <i>Bacillus thuringiensis aizawai</i>	I-BT	G	see footnote 7		4	N	N	N
Yield Shield, <i>Bacillus pumilus</i> GB34	F-BT	G			NA	NA	NA	NA
Zampro, acetotradin + dimethomorph	F	G	>500->2,000	>5,000	12	---	---	---
Zeal, etoxazole	A	G	>5,000	>5,000	12	N	H	N
Zemax, mesotrione + s-metolachlor	H	G	>5,000	>5,050	24	--	--	--
zeta cypermethrin, Mustang Maxx	I-PY	R-10,11	310	>5,000	24	S	H	H
zeta cypermethrin + bifenthrin, Hero	I-PY	R-10,11	550	--	24	S	H	H
Zeus, sulfentrazone	H	G	1,750	>5,000	12	L	L	--
Zidua, pyroxasulfone	H	G	>2,000	>2,000	12	--	H	--
Zing!, zoxamide + chlorothalonil	F	G	1,750 - 5,000	>5,000	12	M	N	N
zoxamide, Gavel	F	G	--	--	48	--	H	H
zoxamide + chlorothalonil, Zing!	F	G	1,750 - 5,000	>5,000	12	M	N	N
2,4-D (acid)	H	R(NJ),G	375	--	12,24	M	N	H
42-S Thiram, thiram	F	G	tech 1,000	>5,000	12	S	H	N

Table D-6: Explanation of Footnotes:

1. **Names:** Trade names begin with capital letters; common names with lower case letters.

2. **Type class:**

A = acaricide; B = bactericide; F = fungicide; H = herbicide; IGR = insect growth regulator; I = insecticide (followed by the following: BO = botanical, BT = bacterial, CA = carbamate, CH = chlorinated hydrocarbon, EI = insect growth regulator [ecdysone inhibitor], FB = fermentation by-product, IO = inorganic, ML = macrocyclic lactone, NN = neonicotinoid, OP = organic phosphate, OT = other, PY = pyrethroid, SO = soap); N = nematocid; and PGR = plant growth regulator.

Explanation of Footnotes continued on next page

D Pesticide Safety

Table D-6 Explanation of Footnotes - continued

3. **Use category:** **R** = restricted use and **G** = general use. Chemicals designated as general or restricted use as determined by state or federal agencies. Restricted use may not apply to all formulations or all uses of a formulation. Check the label to be sure. The designation (NJ) refers to a compound that is classified as restricted use in New Jersey. The number(s) after the R designation refer to the following reasons for being classified as a federal restricted use product:
1. acute oral toxicity
 2. acute dermal toxicity
 3. acute inhalation toxicity
 4. corrosive to eyes
 5. potential to cause tumors
 6. potential to cause genetic mutations
 7. potential to cause adverse reproductive effects
 8. accident history
 9. exposure hazard to workers
 10. potential effects on wildlife
 11. potential effects on birds
 12. potential effects on fish and/or other aquatic species
 13. potential for groundwater contamination
 14. lack of data
4. **LD50** = milligrams of substance per kilogram of body weight of the test animal. > = higher than the figure listed. Formulations: LD50 values given are for formulated material as you would purchase it; for example, 50WP, 4E, etc., unless otherwise noted. Source: 2001 Farm Chemicals Handbook; information is listed as supplied by manufacturer.
5. **REI**=Restricted Entry Interval (hours): The EPA Worker Protection Standard now requires minimum 12-hour REI for all Category III (CAUTION) pesticides, 24-hour minimum REI for all Category II (WARNING) pesticides, and 48-hour minimum REI for all Category I (DANGER) pesticides. In New Jersey, the NJDEP Pesticide Control Program has designated 48-hour REI's for some pesticides which EPA has assigned 12- or 24-hour REI's. Chemicals with multiple designations are based on product and/or formulation differences.
6. **N**=nontoxic; **L**=minimum impact on bees; **M**=moderately toxic; can be used if dosage, timing and method of application are correct but should **NOT** be applied directly to crop if bees are present; **H**=highly toxic, severe losses expected.
7. Toxicity of *Bacillus thuringiensis* is listed as harmless to humans, animals, and useful insects. Note that some formulations of BT may require safety equipment; follow the label. *Bacillus thuringiensis* materials are marketed as several different subspecies such as *aizawai*, *kurstaki*, and *tenebrionis*. Different *Bacillus thuringiensis* subspecies may have different insect control properties. **Check labels for pest insects controlled before use.**
8. Acute vapor toxicity, 200 ppm, extremely hazardous by vapor inhalation. Liquid can cause eye and skin burns.
9. Fixed coppers are listed under several commercially available trade names. Examples are: Basicop, Champ, Champion, Copper-Count-N, Cuprofix Disperss, Kocide, Super Cu, Tenn-Cop, Top Cop with Sulfur, Top Cop Tri-Basic, and Tri-Basic Copper Sulfate.
10. **For toxicity information on fungicide combinations**, see toxicity of each component listed by the common chemical name in this table.