

PESTICIDE SAFETY

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 to work under the direct supervision of a certified individual.

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 fellowman, or the environment.

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. Private applicators who purchase and apply restricted-use pesticides must be certified and registered. In New Jersey, private applicators must be certified and registered to apply **any** pesticide.

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 registered to use **any** pesticide in New Jersey.

For detailed information on certification of pesticide applicators, call your state agency or Extension agent. See the back cover of this publication for phone numbers of pesticide certification agencies.

Pesticide Operator Registration (*New Jersey*)

Anyone applying pesticides under direct supervision of a commercial certified pesticide applicator must be registered as a pesticide *operator* unless the certified applicator is *always* physically present when the uncertified individual is handling pesticides. Contact the Pesticide Control Program for more information on pesticide operator training and registration (see back cover).

HANDLING PESTICIDES

Before opening a pesticide container, all applicators should read the label carefully, and accurately follow all directions and precautions specified by the labeling. In order to handle and apply pesticides safely, it is essential to use the proper safety equipment and protective clothing. For the custom or professional applicator, which includes both private and commercial applicators, safety equipment should at least consist of unlined neoprene or rubber boots and gloves, waterproof hat, coat, and coveralls, an approved respirator, and proper measuring equipment.

Your physician should be advised of the types of pesticides you use in your work. 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 should be redetermined.

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 of certain pesticides in the eye is extremely hazardous. 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 Guthion and Lannate.

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 while using pesticides. **Avoid** inhaling pesticide sprays, dusts, and vapors.

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. Wash contaminated clothing separately. After each spraying or dusting, bathe and change your clothing; always begin the day with clean clothing.

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 desirable 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 nontarget areas. Dusts drift more than sprays; airblast 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.

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 New Jersey and for Category 7 operators in Delaware. Containers must be well secured to prevent breakage or spillage. An adequate supply of absorbent material, a shovel, and a fire extinguisher must be available. While under transport, pesticides must be stored in a separate compartment from the driver. 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 in motion.

The above requirements do not apply if the pesticide is being transported within the application equipment tank.

For additional information on pesticide transport, contact the Pesticide Control Program office or the Cooperative Extension pesticide office in your state.

Pesticide Storage

Pesticides should always be stored in their original containers and kept tightly closed. 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 weedkillers 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 the pesticides in a cool, dry, well-ventilated area that is not accessible to children and others who do not know and understand the safe and proper use of pesticides. Special precautions may be needed in case of a fire in these storage areas.

Any restricted pesticide or container contaminated by restricted pesticides **must** be stored in a secure, locked enclosure while unattended. That enclosure **must** bear a warning that pesticides are stored there. If any pesticide has to be stored in other than its original container, 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 storages. 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.

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 out of direct sunlight.

The following points should be followed:

1. Read the label. Special storage recommendations or restrictions will be printed on the label.
2. Write the purchase or delivery date of the product on the label with indelible ink. Products may lose their effectiveness over several years.
3. Ventilation is important for storage of most pesticides.
4. Store herbicides separately from other pesticides to avoid contamination.
5. Signs of quality deterioration are shown in Table D-1.

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.

After freezing, place pesticides in warm storage (50°-80°F [10°-26.7°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 a listing of winter storage of pesticides, see Table D-2. Additional information can be obtained from manufacturers' websites.

Disposal of Pesticides

Pesticides should not be disposed of in sanitary landfills or by incineration, unless these locations and equipment are especially designed and licensed for this purpose by the state.

The best method to dispose of a pesticide is to use it in accordance with current label registrations. The **triple rinse-and-drain** procedure or the **pressure-rinse** procedure is the recommended method to prepare pesticide containers for safe disposal. 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. See back cover for telephone numbers.

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.

Carbamate Pesticides

Usually these chemicals decompose rapidly in soil; many break down much faster in an alkaline situation. Examples of such carbamate chemicals are carbaryl and carbofuran.

Table D-2. Winter Storage of Chemicals

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			
Di-Syston 6LC		x		x		
Dual Magnum		x		x		
Eptam 7E			x		x	
Furadan 4F	x		x			
Fusilade DX		x		x		
Goal 2XL	x					
Gramoxone	x				x	
Imidan WP		x				
Lannate	x				x	
Lexone 4L	x		x			
Lorox 4L	x		x			
Lorsban 4E		x			x	
malathion EC		x			x	x
Metasystox-R		x			x	
Micro-Tech	x				x	
Monitor 4E		x		x		
Partner	x				x	
Penncap-M		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 4F		x			x	
Solicam 80DF		x				
Surflan AS		x			x	
Treflan EC			x			
2,4-D amine	x		x			
Vydate L	x					

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

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.

FARM WORKER SAFETY

Identifying Treated Areas

New federal farm worker safety regulations are in effect that impact how 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 step 3 below is followed. All agricultural pesticides now have reentry times that range from 4 to 48 hours or longer. Check your pesticide's label for the reentry time in effect.
3. Workers who enter treated fields before the end of the label specified reentry time must have been properly trained under the WPS regulations, must be provided with the protective equipment specified on the pesticide's label, cannot perform hand labor tasks such as thinning or harvesting, and can only spend up to 1 hour per day in the treated field. 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.
4. Farm workers must be orally informed, in their native language, of all reentry times (*this is mandatory in New Jersey*). If workers are not orally notified or the label requires it, the treated field 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. 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 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 (See "Spray Record" in the back of this publication for an example) 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 Department of Agriculture, Department of Environmental Protection, or local county Cooperative Extension office.

Respiratory Protective Devices for Pesticides

You may be subject to exposure to toxic gases, vapors, and/or particulates when using pesticides. Although our respiratory (breathing) system tolerates exposure to a limited degree, 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. 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" 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*.

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) and the Mine Safety and Health Administration (MSHA) jointly certify respirators for the contaminant or situation of exposure. Approvals for these respirators bear both NIOSH and MSHA emblems and certification numbers under 30 CFR part 11.

When purchasing a new respirator, the certification numbers per respirator type, according to **current** 'part 84' NIOSH approved criteria, is 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)

The new 'TC-84' certification creates a total of 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

- 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 efficiencies for filters, most manufacturers are marketing only the 95% and 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. 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. EPA label statements allow for use of either the old 'part 11' respirators with MSHA/NIOSH certifications, as well as the new 'part 84' respirators with NIOSH certification. It is surmised that EPA provides for the use of the now obsolete respirators so that the stock may be used until depleted.) If the pesticide label specifies N-, R-, or P-series filtering elements, do not to use the N-series when oil is present.

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. Thus, 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

With the exception of hooded-powered, air-purifying respirators, no one respirator will fit everyone. The protection provided to a respirator wearer is a function of how well the facepiece (mask) fits. No matter how efficient the purifying element or how clean the supplied air, little

protection is provided when there is a leaky face-to-facepiece seal.

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 even the 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 should be performed in order to select the best fitting respirator. Kits for qualitative testing are now marketed and easy to use.

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. Allow 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.

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 or agency in your state. See back cover for emergency telephone numbers. 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 or agency in your state. See back cover for emergency telephone numbers.
- Be prepared to give the active ingredient name (common generic name)

PROTECT THE ENVIRONMENT

General Guidelines

- Do not burn pesticides. The smoke from burning pesticides is dangerous 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.
- 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.

Notification of Beekeepers *(for New Jersey only)*

Beekeepers registered with the 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 Pesticide Control Program, CN 411, Trenton, NJ 08625. For more detailed information and regulations, contact the Pesticide Control Program or the Rutgers Cooperative Extension Pesticide Office. See inside back cover for telephone numbers.

Protecting Your Groundwater

Groundwater is the water contained below our soils. This water is used by 90 percent 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. In areas where it is deep, we find arid regions.

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 ¹		Water Solubility ² (ppm)	Half Life ³ (Days)
	Soil K_d	OM K_{oc}		
alachlor	4.35	190	242.0	14
atrazine	127.00	160	33.0	60
carbofuran	29.00	29	700.0	30
Dacthal	--	5,000	0.0	30
disulfoton	32.30	2,000	25.0	4
fenamiphos	4.41	171	700.0	20
methomyl	0.03	28	57,900.0	8
metribuzin	0.11	41	1,200.0	30
oxamyl	0.16	1	280,000.0	7
S-metolachlor	--	200	530.0	20
terbacil	0.78	41	710.0	90

¹ OM = organic matter. Chemicals with a lower K_d or K_{oc} number have a greater chance for groundwater contamination.

² Chemicals with higher water solubility have a greater chance for groundwater contamination.

³ Chemicals with longer half-life have 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.
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. 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,

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. Use some type of anti back-flow 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 New Jersey these devices are now required for sprayers by state law. New Jersey law requires that anti back-flow devices be placed on all sprayer water intake systems prior to the water entering the tank. The use of an air gap only, is no longer acceptable.
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 beginning of 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 in too high an amount 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 pesticides, when not needed, 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 downward movement of a pesticide.

Remember, you must protect your groundwater.

Pesticide Spills

Keep a supply of absorbent on hand to scatter over liquid spills in the storage room. Sawdust or janitorial sweeping compound works well in absorbing the liquids in a cleanup. Use a respirator and rubber gloves to clean up spills; cover the contaminated surface with household lye, trisodium phosphate, or liquid detergent. Let it soak a couple of hours and reabsorb the solution from the floor. This procedure is recommended for cleaning truck beds that are contaminated.

Specific information concerning pesticide cleanup can be obtained by calling the manufacturer directly. The phone numbers for emergencies are listed on every product label. Information can also be obtained by calling CHEMTREC at 800/424-9300.

Report pesticide spills to the proper state agency. See back cover for telephone numbers.

Reporting of Pesticide Spills (New Jersey only)

Any registered pesticide applicator, or any registered pesticide applicator business, shall 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. the name of the pesticide applicator,
2. the name of the applicator business, if any,
3. the name of the property owner or operator,
4. the location of the incident,
5. the name and EPA registration number of the pesticide,
6. the estimated amount of pesticide involved, and
7. the corrective action taken.

The report shall be made to the DEP immediately and may be made by telephone to the Pesticide Control Program or the DEP hotline at 877-927-6337. Submit a written follow-up within 10 days to the Pesticide Control Program, PO Box 411, Trenton, NJ 08625.

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.

Toxicity values are expressed as acute 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. 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	2,000-20,000
IV	None ²	5,000	20,000

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

² No 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 appropriate poison information number on the back cover of this book.

Toxicity and LD₅₀ Calculations

Weight Conversions

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

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

(lb)	(kg)
25	= 11.25
50	= 22.5
75	= 33.75
100	= 45
150	= 67.5
200	= 90

To figure an exact weight, multiply known body weight in pounds by 0.45. *Example:* 100 lb x 0.45 = 45 kg

Note: All the following calculations use a body weight of 100 pounds. To figure LD₅₀, first convert body weight to kilograms; to do this multiply weight in lb by 0.45.

Example: 100 x 0.45 = 45 kg

Next, multiply given LD₅₀ by body weight in kg.

Note: LD₅₀ numbers are given by the manufacturer.

Example: LD₅₀ of 11 x 45 kg = 495 mg

Next, to convert milligrams (mg) to ounces (oz), multiply mg by 0.000035. *Example:* 495 mg x 0.000035 = 0.017 oz.

Table D-5. LD₅₀ figures converted to ounces for three commonly used products in the agricultural industry.

LD ₅₀	Body Weight in Pounds					
	30	60	100	150	200	
	----- Ounces -----					
Insecticide						
Furadan	11	0.005	0.010	0.017	0.026	0.035
Herbicide						
Micro-Tech/ Partner	1,800	0.9	1.7	2.8	4.3	5.7
Fungicide						
chloro- thalonil	10,000	4.9	9.5	15.7	23.8	31.5

Pesticide Formulations

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

In most cases, Cooperative Extension suggests that sprays rather than dusts be applied to control pests of vegetables. This is because sprays have produced better control and resulted in less drift.

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

Table D-6. Toxicity of Chemicals¹

Name ²	Type Class ³	Use Category ⁴	LD ₅₀ Values Mg/Kg ⁵		Reentry ⁶ (Hours)	Toxicity ⁷		
			Oral	Dermal		Bird	Fish	Bee
abamectin, Agri-Mek, ABBA, Epi-Mek, Temprano	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
acephate, Orthene	I-OP	G	tech 980	>10,250	24	M	N	H
acetamiprid, Assail	I	G	1,064	>2,000	12	N	N	M
acibenzolar-S-methyl, Actigard, Blockade	B,F	G	--	--	12	N	M	N
Acramite, bifentate	A	G	>5,000	>5,000	12	N	H	N
Actara, thiamethoxam	I-NN	G	>5,000	>2,000	12	N	N	H
Actigard, acibenzolar-S-methyl	B,F	G	--	--	12	N	M	H
Admire, imidacloprid	I-NN	G	tech 450	>5,000	12	M	M	H
Admire Pro, imidacloprid	I-NN	G	tech 450	>5,000	12	M	M	H
Address, acephate	I-OP	G	tech 980	>10,250	24	M	N	H
Agree, <i>Bacillus thuringiensis aizawai</i> + <i>kurstaki</i>	I-BT	G	See Footnote 8		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-Mycin-17, streptomycin	B	G	9,000	--	12	--	--	--
Agri-Strep, streptomycin	B	G	9,000	--	12	--	--	--
Agrox D-L Plus	F,I	G	--	--	12	H	H	H
Agrox 2-Way	F,I	G	--	--	12	H	H	H
Aim, carfentrazone	H	G	5,143	>5,000	12	N	M	N
alachlor, Micro-Tech, Partner	H	R-12	1,800	--	12	N	N	N
Alanap L, naptalam	H	G	8,200	--	24	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, chlorantranilprole	I	G	>5,000	>5,000	4	--	--	--
Ambush, permethrin	I-PY	R-12	tech 430-4,000	>4,000	24	N	H	H
Amistar, azoxystrobin,	F	G	>2,000	>5,000	4	--	H	N
Ammo, cypermethrin	I-PY	R	250	>2,000	12	N	H	H
Apron, mefenoxam, metalaxyl	F	G	tech 669	>3,100	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-P-ethel	H	G	1,210	--	12	N	N	N
Atrazine, atrazine	H	G	tech 1,780	7,500	12	S	S	N
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
azinphos-methyl, Guthion	I-OP	R-1,2,3, 8,10,12	tech 5-20	220	48	M	H	H
azoxystrobin, Abound, Amistar, Dynasty, Quadris,	F	G	>2,000	>5,000	4	--	H	N
azoxystrobin + chlorothalonil, Quadris opti	F	G	>2,000	>5,000	4	N	H	N
Aztec, cyfluthrin + tebufospyrifos	I	--	--	--	12	--	H	N
<i>Bacillus pumilus</i> GB34, Yield Shield	F-BT	G			NA	NA	NA	NA
<i>Bacillus subtilis</i> GB03, Kodiak	F-BT	G			NA	4	NA	NA
<i>Bacillus thuringiensis</i> , Biobit	I-BT	G	See Footnote 8		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 ¹⁰	F	G	472	--	24	--	H	N
Baythroid XL, beta-cyfluthrin	I	R	647	>2,000	12	--	H	H
Beleaf, flonicamid	I	G	>2,000	>2,000	12	--	N	--

Table D-6. Toxicity of Chemicals¹ (continued)

Name ²	Type Class ³	Use Category ⁴	LD ₅₀ Values Mg/Kg ⁵		Reentry ⁶ (Hours)	Toxicity ⁷		
			Oral	Dermal		Bird	Fish	Bee
Belt, flubendiamide	I	G	>2,000	>4,000	12	--	--	--
bensulide, Prefar	H	G	tech 271-1,470	--	12	--	H	H
bentazon, Basagran	H	G	2,063	>6,050	12	S	N	N
beta-cyfluthrin, Baythroid XL	I	R	647	>2,000	12	--	H	H
bifenthrin, Bifenture, Brigade, Capture, Discipline, Empower, Fanfare, Sniper Tundra	I-PY	R	262	>2,000	244	M	H	H
Bifenture, bifenthrin	I-PY	R	262	>2,000	244	M	H	H
bifenzate, Acramite, Floramite	A	G	>5,000	>5,000	12	N	H	N
Biobit, <i>Bacillus thuringiensis kurstaki</i>	I-BT	G	See Footnote 8		4	N	N	N
Blockade, acibenzolar-S-methyl	B,F	G	--	--	12	N	M	N
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
Brominal, bromoxynil	H	G	tech 260	>2,000	12	H	H	H
bromoxynil, Brominal, Buctril	H	G	tech 260	>2,000	12	H	H	H
Buctril, bromoxynil	H	G	tech 260	>2,000	12	H	H	H
buprofenzin, Courier, Talus	IGR	G	>5,000	>2,000	12	--	--	--
butylate, Sutan +	H	G	4,500	>4640	2	--	H	--
Cabrio, pyraclostrobin	F	G	>500	>4,000	12	--	H	N
Callisto, mesotrione	H	G	>5,000	>5,000	12	N	N	N
Captan 400, captan	F	G	9,000	--	96	S	H	N
*captan, Captan 400	F	G	9,000	--	96	S	H	N
Captevate, fenhexamid + captan	F	G	>2,000	>5,000	24	N	H	N
*carbaryl, Sevin	I-CA	G	500	850	12	S	N	H
carbofuran, Furadan	I,N-CA	R-3	8	>3,000	48	H	M	N
carfentrazone, Aim	H	G	5,143	>5,000	12	--	M	N
CDAA, Radox	H	G	750	--	12	--	--	--
Champ, fixed copper ¹⁰	F	G	1,000	--	12	--	H	N
Champion, fixed copper ¹⁰	F	G	2,000	--	12	--	H	N
Chateau/Valor, flumioxazin	H	G	>5,000	>2,000	12	N	N	N
chlorantraniliprole, Altacor, Coragen	I	G	>5,000	>5,000	4	--	--	--
chlorethoxyfos, Fortress	I-PY	R	tech 1.8-4.8	12.5-18.5	48	H	H	N
chlorine, Clorox (bleach)	F	G	--	--	12	N	N	N
Chloro IPC, chlorpropham	H	G	3,800	--	48	--	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	H
chlorphanapyr, Pylon	A	G	560	--	12	--	H	H
chlorpropham, Chloro IPC, Sprout Nip	H	G	3,800	--	48	--	N	N
*chlorpyrifos, Lorsban	I-OP	R	92-276	2,000	12,24	M	H	H
clethodim, Select	H	G	3,610	>5,000	12,24	L	M	L
clomazone, Command	H	G	1,369	>2,000	12	--	--	--
clopyralid, Stinger	H	G	>5,000	>2,000	12	--	N	N
Clorox (bleach), chlorine	F	G	--	--	12	N	N	N
clothianidin, Poncho	I-NN	G	>5,000	>2,000	--	N	M	H
Command, clomazone	H	G	tech 2,077	>2,000	12	--	N	N

Table D-6. Toxicity of Chemicals¹ (continued)

Name ²	Type Class ³	Use Category ⁴	LD ₅₀ Values Mg/Kg ⁵		Reentry ⁶ (Hours)	Toxicity ⁷		
			Oral	Dermal		Bird	Fish	Bee
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
<i>Coniothyrium minitans</i> , Contans	F	G	--	--	4	--	N	N
Contans, <i>Coniothyrium minitans</i>	F	G	--	--	4	--	N	N
Copper-Count-N, fixed copper ¹⁰	F	G	--	--	12	--	H	N
copper, fixed ¹⁰	F	G	--	--	24	--	H	N
copper hydroxide, Ridomil Gold Copper, ManKocide	F	G	tech 669	>3,100	48	--	H	N
Coragen, chlorantranilprole	I	G	>5,000	>5,000	4	--	--	--
Counter, terbufos	I-OP	R-1,2	tech 4.5	1.1	48	--	H	N
Courier, buprofenzin	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 8		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 3E, ethalfuralin	H	G	>10,000	>10,000	12	--	H	N
Curzate, cymoxanil	F	G	433	>5,000	12	N	H	N
*Curzate M-8, cymoxanil + mancozeb	F	G	See Footnote 11		12			
Cutlass, <i>Bacillus thuringiensis kurstaki</i>	I-BT	G	See Footnote 8		4	N	N	N
cyazofamid, Ranman	F	G	>5,000	>2,000	12	L	L	L
*cycloate, Ro-Neet	H	G	3,160-4,640	--	12	--	M	N
cyfluthrin, Renounce, Tombstone	I-PY	R	500	>5,000	12	M	H	H
cymoxanil, Curzate,	F	G	433	>5,000	12	N	H	N
cymoxanil, Curzate M-8, Manex C-8	F	G	1,100	>3,000	12	L	H	N
cymoxanil + macozeb, Manex C-8								
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
Cythion, malathion	I-OP	G	tech 5,500	>2,000	12	M	H	H
*Dacthal, DCPA	H	G	>10,000	>2,000	24	S	--	N
*dalapon, Dowpon M	H	G	9,330	--	24	S	N	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
Desiccate II, endothall	H	R	233	481	48	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	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
diflubenzuron, Dimilin	IGR	G	>10,000	>20,000	12	--	--	--
*Dimate, dimethoate	I-OP	R(NJ),G	tech 235	>400	48	H	H	H
dimethenamid, Frontier, Outlook	H	H	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
Dimilin, diflubenzuron	IGR	G	>10,000	>20,000	12	--	--	--
dinotefuran, Venom	I	G	>5,000	>5,000	12	--	--	H
DiPel, <i>Bacillus thuringiensis kurstaki</i>	I-BT	G	See Footnote 8		4	N	N	N

Table D-6. Toxicity of Chemicals¹ (continued)

Name ²	Type Class ³	Use Category ⁴	LD ₅₀ Values Mg/Kg ⁵ Reentry ⁶			Toxicity ⁷		
			Oral	Dermal	(Hours)	Bird	Fish	Bee
diquat	H	G	215-235	400	24	--	--	N
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
Dowpon M, dalapon	H	G	9,330	--	24	S	N	N
Dual Magnum, S-metolachlor	H	G	tech 2,780	>10,000	12	S	M	N
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
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
Empower ² , bifenthrin	I-PY	R	262	>2,000	24	M	H	H
endosulfan, Thiodan, Phaser	I-CH	R(NJ),G	tech 160	>500	48	H	H	N
endothall, Desiccate II	H	R	233	481	48	H	--	H
Endura, boscalid	F	G	>2,000	>2,000	12	--	--	--
Entrust, spinosad	I-ML	G	>5,000	>2,000	4	H	--	--
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
ethalfluralin, Curbit 3E	H	G	>10,000	>10,000	12	--	H	N
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
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, Namacur	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
fipronil, Regent	I	R	275	841	0	M	H	M
fixed copper ¹⁰ , 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	--
Floramite, bifentrate	A	G	>5,000	>5,000	12	N	H	N
Flouronil, mefenoxam+chlorothalonil	F	G	See Footnote 11		48			
*fluazifop-P-butyl, Fusilade DX	H	G	3,328	--	12	--	M	N
fluazinam, Omega	F	G	>5,000	>2,000	48	--	H	N
flubendiamide, Belt, Synapse	I	G	>2,000	>4,000	12	--	--	--
fludioxonil, Maxim	F	G	>5,000	>2,000	12	L	H	L
fludioxonil + mancozeb, Maxim MZ	F	G	>5,000	>5,000	24	N	H	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

Table D-6. Toxicity of Chemicals¹ (continued)

Name ²	Type Class ³	Use Category ⁴	LD ₅₀ Values Mg/Kg ⁵ Reentry ⁶			Toxicity ⁷		
			Oral	Dermal	(Hours)	Bird	Fish	Bee
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
fomesafen, Reflex	H	G	6,950	>1,000	24	N	N	N
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
Fortress, chlorethoxyfos	I-PY	R	tech 1.8-4.8	12.5-18.5	48	H	H	--
Forum, dimethomorph	F	G	3,900	>2,000	24	--	H	N
fosetyl AI, Alette	F	G	5,000	>2,000	12,24	N	N	N
Frontier, dimethenamid	H	G	849	>2000	12	--	--	--
Fulfill, pymetrozine	I-OT	G	>5,000	>2,000	12	N	N	N
Furadan, carbofuran	I,N-CA	R-3	8	>3,000	48	H	M	N
Fury, zeta-cypermethrin	I-PY	R-10,12	--	--	12	--	H	H
Fusarex, TCNB	GR	G	--	--	--	--	--	--
*Fusilade DX, fluazifop-P-butyl	H	G	2,712	>2,420	12	--	M	N
gammacyhalothrin, Proaxis,	I-PY	R-12	>2,500	>5,000	24	N	H	H
Gaicho, 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
GibGro, gibberellic acid	PGR	G	1,000-25,000	--	4	--	N	N
glufosinate ammonium, Ignite 280	H	G	>300-<2,000	1,400	12	--	--	--
Glyphomax Plus, glyphosate glyphosate, Glyphomax Plus, Roundup Touchdown	H	G	>5,000	>5,000	24	N	N	N
Goal, oxyfluorfen	H	G	tech >5,000	>10,000	24	--	H	N
Gramoxone Max, 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, Sandea	H	G	1,287	>5,000	12	--	N	N
harpin protein, Messenger	F	G	>5,000	>6,000	4	--	N	N
Headline, pyraclostrobin	F	G	>500	>4,000	12	--	H	N
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, Gaicho, Lattitude, Provado	I-NN	G	tech 450	>5,000	12	M	M	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-CA	G	268	--	12	M	M	H
Ignite 280, glufosinate ammonium	H	G	>300-<2000	1,400	12	--	--	--
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 8		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

Table D-6. Toxicity of Chemicals¹ (continued)

Name ²	Type Class ³	Use Category ⁴	LD ₅₀ Values Mg/Kg ⁵		Reentry ⁶ (Hours)	Toxicity ⁷		
			Oral	Dermal		Bird	Fish	Bee
Kerb, pronamide	H	R-5	tech 8,350	>3,160	12	--	N	N
Ketch, <i>Bacillus thuringiensis aizawai</i>	I-BT	G	See Footnote 8		4	N	N	N
Kickstart, carboxin+diazinon+lindane	I	G	829	>2,000	12	H	H	N
Kickstart VP, carboxin+permethrin	I	G	>5,050	>5,050	--	H	H	N
Knack, pyriproxyfen	IGR	G	>5,000	>2,000	12	--	H	N
Kocide, fixed copper ¹⁰	F	G	1,000	--	12,48	M	H	N
Kodiak, <i>Bacillus subtilis</i> GB03	F-BT	G		NA	NA	NA	NA	NA
Kryocide, cryolite	I-IO	G	>5,000	--	12	N	N	N
lambdacyhalothrin, Lambda-Cy, Lambda T Silencer, Warrior	I-PY	R	tech 79	632	24	M	H	H
Lambda-Cy, lambdacyhalothrin	I-PY	R	tech 79	632	24	M	H	H
Lambda T, lambdacyhalothrin	I-PY	R	tech 79	632	24	M	H	H
Lannate, methomyl	I-CA	R-8,10	17	5,880	48	H	H	H
Larvin, thiodicarb	I-CA	G	66	>2,000	12	H	H	M
Lattitude, imidacloprid	I-NN	G	tech 450	>5,000	12	M	M	H
Laudis, tembotrione	H	G	1,750	>5,000	12	--	--	--
Lepinox, <i>Bacillus thuringiensis kurstaki</i>	I-BT	G	See Footnote 8		4	N	N	N
Lexone, metribuzin	H	R-14	tech 2,000	20,000	12	--	N	N
lindane	I-CH	R-5	88-125	1,000	12,24	M	M	N
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
malathion, Cythion	I-OP	G	tech 5,500	>2,000	12	M	H	H
*mancozeb, Acrobat MZ, Curzate M-8, Dithane, Manex II, Manex C-8, ManKocide, Penncozeb, Ridomil Gold MZ	F	G	11,200	15,000	24	--	H	N
mancozeb + copper hydroxide, ManKocide	F	G	See Footnote 11			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
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
Manex C-8, cymoxanil + mancozeb	F	G	See Footnote 11		24			
ManKocide, mancozeb + copper hydroxide	F	G	See Footnote 11		48			
Matrix, rimsulfuron	H	G	>5,000	>2,000	4	N	L	L
Matth, <i>Bacillus thuringiensis</i> encapsulated delta endotoxin	I-BT	G	See Footnote 8		4	N	N	N
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 9		48	--	--	N
mefenoxam, Apron, Ridomil Gold, Ultra Flourish	F	G	--	--	--	--	H	N
mefenoxam + chlorothalonil, Ridomil Gold Bravo, Flouronil	F	G	See Footnote 11					
mefenoxam + copper hydroxide, Ridomil Gold Copper	F	G	See Footnote 11					

Table D-6. Toxicity of Chemicals¹ (continued)

Name ²	Type Class ³	Use Category ⁴	LD ₅₀ Values Mg/Kg ⁵		Reentry ⁶ (Hours)	Toxicity ⁷		
			Oral	Dermal		Bird	Fish	Bee
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
Messenger, harpin protein	F	G	>5,000	>6,000	4	--	N	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, oxydemeton methyl	I-OP	R	tech 50	150	48	--	H	H
methamidophos, Monitor	I-OP	R-2,11	tech 20	130	48	H	M	H
methomyl, Lannate	I-CA	R-8,10	17	5,880	48	H	H	H
methoxychlor	I-CH	G	6,000	--	12	S	N	M
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 9		48	--	--	N
methyl iodide, Midas	F, H, I	--	--	--	--	--	--	--
*methyl parathion	I-OP	R-2,8,10,11	6	50	48	H	H	H
*methyl parathion (encapsulated), Penncap-M	I-OP	R-2,8,10,11	>600	>5,400	48	H	H	H
metribuzin, Sencor, Lexone	H	R-14	tech 1,100-2,300	>20,000	12	--	M	N
Micro-Tech, alachlor	H	R-12	930-1,350	--	12	S	M	N
Midas, methyl iodide	F, H, I	--	--	--	--	--	--	--
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
Monitor, methamidophos	I-OP	R-2,11	tech 20	130	48	H	M	H
Movento, spirotetramat	I	G	>2000	>4000	12	N	N	H
M-Pede, insecticidal soap	I-SO	G	16,900	--	12	N	N	N
Mustang, zeta-cypermethrin	I-PY	R-10,11	--	--	12	--	H	H
myclobutanil, Nova	F	G	1,600	>5,000	24	--	N	N
napropamide, Devrinol	H	G	>4,640	--	12	--	N	N
naptalam, Alanap L	H	G	1,770	--	24	--	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
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 8		4	N	N	N
novoluron, Rimon	I-IGR	G	3,914	>2,000	12	N	H	N
Noxfire, rotenone	I-BO	G	132-1,500	--	12,48,24	S	H	N
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
Orthene, acephate	I-OP	G	tech 980	>10,250	24	M	N	H
oryzalin, Surflan	H	G	>10,000	--	12	--	H	N
Outlook, dimethenamid	H	G	849	>2000	12	--	--	--
oxamyl, Vydate L	I,N-CA	R	37	2,960	48	H	H	H
*oxydemeton-methyl, Metasystox-R	I-OP	R	tech 50	150	48	--	H	H
oxyfluorfen, Goal	H	G	tech >5,000	>10,000	24	--	H	N
paraquat, Gramoxone Max	H	R-1,8	150	--	12,48	M	N	N
Partner, alachlor	H	R-12	930-1,350	--	12	S	M	N
PBO (piperonyl butoxide)	I-OT	G	>7,500	--	12	N	N	N
PCNB, Terraclor	F	G	tech 1,700-5,000	2,000-4,000	12,24	S	H	H

Table D-6. Toxicity of Chemicals¹ (continued)

Name ²	Type Class ³	Use Category ⁴	LD ₅₀ Values Mg/Kg ⁵		Reentry ⁶ (Hours)	Toxicity ⁷		
			Oral	Dermal		Bird	Fish	Bee
pebulate, Tillam	H	G	tech 921-1,900	>4,640	12	--	M	S
pendimethalin, Prowl	H	G	1,250	>5,000	12,24	--	M	N
*Pennacap-M, methyl parathion (encapsulated)	I-OP	R-2,8,10,11	>600	>5,400	48	H	H	H
Penncozeb, mancozeb	F	G	11,200	>15,000	24	--	H	N
permethrin, Ambush, Perm-Up, Pounce	I-PY	R-12	tech >4,000	>4,000	24	N	H	H
Perm-Up, permethrin	I-PY	R-12	tech >4,000	>4,000	24	N	H	H
Phaser, endosulfan	I-CH	R(NJ),G	tech 160	>500	48	H	H	N
*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	F	G	>5,000	>5,000	4	N	H	N
Phostrol, phosphite salts	F	G	>5,000	>5,000	4	N	H	N
Platinum, thiamethoxam	I-NN	G	>5,000	>2,000	12	--	M	N
Poast, sethoxydim	H	G	3,200-3,500	>5,000	12,24	S	M	S
Poncho, clothianidin	I-NN	G	>5,000	>2,000	--	N	M	H
Potato Seed Treater, EBDC	F	G	4,500	>5,000	24	N	H	N
Pounce, permethrin	I-PY	R-12	tech 430-4,000	>4,000	24	N	H	H
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
Pristine, pyraclostrobin + boscalid	F	G	>2,000	>2,000	12	--	H	--
Proaxis, gammacyhalothrin	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
Procure, 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
Prolong, <i>Bacillus thuringiensis kurstaki</i>	I-BT	G	See Footnote 8		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
ProPhyt, phosphite salts	F	G	>5,000	>5,000	4	N	H	N
*propiconazole, Tilt	F	G	1,517	>4,000	24	--	H	N
Provado, imidacloprid	I-NN	G	tech 450	>5,000	12	M	M	H
Prowl, pendimethalin	H	G	3,956	2,200	12,24	--	M	N
Pursuit, imazethapyr	H	G	>5,000	>2,000	12,24	--	N	N
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	--
pyrethrum	I-BO	G	1,500	>1,800	12	N	H	M
Pyrimethanil, Scala	F	G	4,505	>5,000	12	--	M	--
pyriproxyfen, Distance, Knack	IGR	G	>5,000	>2,000	12	--	H	N
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
Quintec, quinoxifen	F	G	>2,000	>2,000	12	N	H	--
quizalofop-P-ethyl, Assure II	H	G	1,210	--	12	N	N	N
Radiant, spinetoram	I	G	>5,000	>5,000	4	N	N	N
Randox, CDAA	H	G	750	--	12	--	--	--
Ranman, cyazofamid	F	G	>5,000	>2,000	12	L	L	L
Raptor, imazamox	H	G	>5,000	>4,000	4	N	N	N

Table D-6. Toxicity of Chemicals¹ (continued)

Name ²	Type Class ³	Use Category ⁴	LD ₅₀ Values Mg/Kg ⁵		Reentry ⁶ (Hours)	Toxicity ⁷		
			Oral	Dermal		Bird	Fish	Bee
Raven, <i>Bacillus thuringiensis tenebrionis</i>	I-BT	G	See Footnote 8		4	N	N	N
Reflex, fomesafen	H	G	6,950	>1,000	24	N	N	N
Regent, fipronil	I	R	275	841	0	M	H	M
Renounce, cyfluthrin	I-PY	R	500	>5,000	12	M	H	H
Reason, fenamidone	F	G	>5,000	>5,000	12	--	--	--
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	I-BT	G	See Footnote 8		12			
	F	G	See Footnote 11					
Ridomil Gold Copper, mefenoxam + copper hydroxide	F	G	See Footnote 11		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
Ridomil, metalaxyl	F	G	tech 669	>3,100	12	N	N	N
Rimon, novoluron	I-IGR	G	3,914	>2,000	12	N	H	N
rimsulfuron, Shadeout	H	G	>5,000	>2,000	4	N	L	L
*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	>5000	>5,000	24	N	N	N
*Rovral, iprodione	F	G	>4,400	>2,000	12	--	S	N
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	--
Select, clethodim	H	G	3,610	>5,000	24	L	M	L
*Sencor, metribuzin	H	R-14	tech 2,000	>20,000	12	--	M	N
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
Silencer, lambda-cyhalothrin	I-PY	R	tech 79	632	24	M	H	H
*Sinbar, terbacil	H	G	5,000-7,500	--	12	--	N	N
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
*Spin-aid, phenmedipham	H	G	>8,000	>4,000	24	--	M	N
spinetoram, Radiant	I	G	>5,000	>5,000	4	N	N	N
spinosad, SpinTor, Entrust	I-ML	G	>5,000	>2,000	4	H	--	--
SpinTor, spinosad	I-ML	G	>5,000	>2,000	4	H	--	--
spiromesifen, Oberon	IGR	G	>2000	>4,000	12	--	H	--
spirotriamat, Movento	I	G	>2000	>4000	12	N	N	H
Sprout Nip, chlorpropham	H	G	3,800	--	48	--	N	N
Stinger, clopyralid	H	G	>5,000	>2,000	12	--	N	N
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	--	--	--
Sutan +, butylate	H	G	4,500	>4640	2	--	H	--
sulfur	A,F,I-IO	G	>5,000	>5,000	12,24,48	N	N	N
Super Cu, fixed copper ¹⁰	F	G	--	--	12	--	H	N

Table D-6. Toxicity of Chemicals¹ (continued)

Name ²	Type Class ³	Use Category ⁴	LD ₅₀ Values Mg/Kg ⁵		Reentry ⁶ (Hours)	Toxicity ⁷		
			Oral	Dermal		Bird	Fish	Bee
Surflan, oryzalin	H	G	>10,000	--	12	--	H	N
Switch, cyprodinil + fludioxonil	F	G	>5,000	>2,000	12	--	H	N
Synapse, flubendiamide	I	G	>2,000	>4,000	12	--	--	--
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	--
tebufenozide, Confirm	I	G	>5,000	>5,000	4	L	H	M
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 ¹⁰	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 9		48	--	--	N
tetradifon, Tedion	A	G	>10,000	>10,000	12	--	--	--
*thiabendazole, Mertect	F	G	>5,000	>5,050	12	N	H	N
thiamethoxam, Actara, Cruiser, Platinum	I-NN	G	>5,000	>2,000	12	N	N	H
*Thimet, phorate	I-OP	R-2,10,11	tech 2-4	20-30	48	H	H	H
thiodicarb, Larvin	I-CA	G	66	>2,000	12	H	H	M
Thionex, endosulfan	I-CH	R(NJ),G	tech 160	>500	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	tech 1,700-5,000	2,000-4,000	12,24	S	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
Tillam, pebulate	H	G	tech 921-1,900	>4,640	12	--	M	S
*Tilt, propiconazole	F	G	1,517	>4,000	24	--	H	N
Tombstone, cyfluthrin,	I-PY	R	500	>5,000	12	M	H	H
topramezone, 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
Touchdown, glyphosate	H	G	>5,000	>5,000	24	N	N	N
Treflan, trifluralin	H	G	>10,000	--	12,24	N	M	N
Tri-Basic Copper Sulfate, fixed copper ¹⁰	F	G	472	--	24	--	H	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
triflumizole, Procure	F	G	2,230	>2,000	12	--	H	N
trifluralin, Treflan, Trilin	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
Trilin, trifluralin	H	G	>10,000	--	12,24	N	M	N
Tundra, bifenthrin	I-PY	R	262	>2,000	24	M	H	H
Ultra Flourish	F	G	--	--	--	--	--	--
Vapam HL, metam-sodium	N	G	1,891	>3,074	48	--	H	N
Vendex, fenbutatin-oxide	A	R	2,631	>2,000	48	M	M	N

Table D-6. Toxicity of Chemicals¹ (continued)

Name ²	Type Class ³	Use Category ⁴	LD ₅₀ Values Mg/Kg ⁵		Reentry ⁶ (Hours)	Toxicity ⁷		
			Oral	Dermal		Bird	Fish	Bee
Venom, dinotefuran	I	G	>5,000	>5,000	12	--	--	H
Vydate L, oxamyl	I,N-CA	R	37	2,960	48	H	H	H
Warrior, lambdacyhalothrin	I-PY	R	tech 79	632	24	M	H	H
XenTari, <i>Bacillus thuringiensis aizawai</i>	I-BT	G	See Footnote 8		4	N	N	N
Yield Shield, <i>Bacillus pumilus</i> GB34	F-BT	G			NA	NA	NA	NA
Zeal, etoxazole	A	G	>5,000	>5,000	12	N	H	N
zeta-cypermethrin, Fury, Mustang	I-PY	R-10,12	--	--	12	--	H	H
zoxamide, Gavel	F	G	--	--	48	--	H	H
2,4-D (acid)	H	R(NJ),G	375	--	12,24	M	N	H
42-S Thiram, thiram	F	G	2,950 (f)-	>4,000	24	N	H	N

-- = Data not available

* = Material covered under the Superfund Amendments and Reauthorization Act of 1986 (SARA) for storage notification.

¹ The Occupational Safety and Health Administration (OSHA) now requires growers to keep on file Material Safety Data (MSD) sheets for certain chemicals used during normal spray programs. These MSD 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 MSD sheet from the manufacturer.

² Names: Trade names begin with capital letters; common names with small.

³ 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 = nematocidal; and PGR = plant growth regulator.

⁴ 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 | 8. accident history |
| 2. acute dermal toxicity | 9. exposure hazard to workers |
| 3. acute inhalation toxicity | 10. potential effects on wildlife |
| 4. corrosive to eyes | 11. potential effects on birds |
| 5. potential to cause tumors | 12. potential effects on fish and/or other aquatic species |
| 6. potential to cause genetic mutations | 13. potential for groundwater contamination |
| 7. potential to cause adverse reproductive effects | 14. lack of data |

⁵ 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.

⁶ Reentry: The EPA Worker Protection Standard now requires minimum 12-hour reentry times for all Category III (CAUTION) pesticides, 24-hour minimum reentry times for all Category II (WARNING) pesticides, and 48-hour minimum reentry times for all Category I (DANGER) pesticides. In New Jersey, the NJDEP Pesticide Control Program has designated 48-hour reentry times for some pesticides which EPA has assigned 12- or 24-hour reentry times. Chemicals with multiple designations are based on product and/or formulation differences.

⁷ 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.

⁸ Toxicity of *Bacillus thuringiensis* is listed as harmless to humans, animals, and useful insects. *Bacillus thuringiensis* is listed under several commercially available trade names such as Agree, Biobit, Cutlass, Crymax, DiPel, Javelin, Ketch, Lepinox, Match, Novodor, Prolong, Raven, and XenTari. *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. Please check labels for pest insects controlled before use.

⁹ Acute vapor toxicity, 200 ppm, extremely hazardous by vapor inhalation. Liquid can cause eye and skin burns.

¹⁰ 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.

¹¹ For toxicity information on fungicide combinations, see toxicity of each component listed by the common chemical name in Table D-6.