ontrols for Vegetable Insects

FOR COMMERCIAL PRODUCERS

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CONTROLS FOR VEGETABLE INSECTS FOR COMMERCIAL PRODUCERS

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Contents

Trade names used in this publication are for identification purposes only and do not endorse products named nor imply criticism of similar products not mentioned.

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Crop	Insect	Insecticide	Pounds Per Acre (Ground)	Pounds Per Acre (Air)	Remarks and Limitations
Asparagus	Cutworms	10% Toxaphene dust	15	20	Apply when cutworms are injuring the stems If stems are cut, be careful not to dust those ready for harvest
		5% DDT dust	15	20	
		Apple-peel bait	10	10	
Beans & Blackeyed Peas (Green or Snap)	Mexican Bean Beetles or Other Bean Beetles	50% Cryolite	18	25–30	When beetles first appear injuring several plants Do not apply Cryolite after pods form Do not use Malathion within 3 days of harvest
		5% Malathion dust	15–18	25–30	
		57% Malathion EC 5 lbs per gallon	1 5–2 pts		
		5% Methoxychlor dust	18	25–30	Methoxychlor 7 days before harvest
		50% Thiodan wettable powder	1 lb	1 lb	Do not apply Thiodan after pods form Be sure to cover under sides of leaves where insects feed
		7 5% (Sevin dust)	18	25–30	Sevin can be used up to harvest
	Thrips	325 mesh conditioned sulfur dust	15	20–25	When leaves show a silvering
		10% DDT dust	15	20–25	Do not use DDT within 7 days of harvest
	Flea Beetles	10% DDT dust	15	20–25	When injury appears harmful Do not apply DDT within 7 days of harvest
		5% Malathion dust	15	20–25	Do not apply Malathion within 1 day of harvest
		57% Malathion EC 5 lbs per gallon	1 5–2 pts		

Crop	Insect	Insecticide	Pounds Per Acre (Ground)	Pounds Per Acre (Air)	Remarks and Limitations
Beans & Blackeyed Peas (Green or Snap) (cont'd)	Lesser Cornstalk Borer	3% Aldrin Granular Aldrin EC 2 lbs. per gal. 2.5% Heptachlor Granular Heptachlor EC 2 lbs. per gal. 2% Dieldrin Granular Dieldrin EC 1.5 lbs. per gal.	15–35 1–2 qts. 20 to 40 1–2 qts. 25–30 ⅓–⅔ gal.		Apply in furrow at time of planting —for all materials
	Corn Earworms	10% DDT dust	15–20		When eggs or small worms first appear. Do not use DDT within 7 days of harvest.
	Seed Corn Maggots	75% Lindane WP 75% Dieldrin WP 25% Ethion WP	⅔ oz. per 100 lbs. of seed ⅓ to ⅔ oz. per 100 lbs. of seed 4 oz. per 100 lbs of seed		Apply as a slurry to seed for best results. Usually fungicide applied at the same time
	Spider Mites	Sulfur dust 2% Parathion dust 2% TEPP dust	25 25 50		Use only fresh dust 3 days before harvest
	Flea Beetles	10% DDT dust	12–15	20–25	Start controls when the flea injury appears in injurious proportions.

Broccoli, Brussels Sprouts, Cabbage, Cauliflower and Radish, Turnips, Mustard	Cabbage Looper and other Cabbage worms	Toxaphene 15% plus 5% DDT dust	15–20	25–30	When eggs first appear on seedling May be used up to 14 days before harvest if wrapper leaves removed. Not after head starts to form if wrapper leaves not removed. Ground equipment on seedlings give best results.
		Toxaphene EC 4 lbs. plus DDT 2 lbs. per gal.	¾ gal.	¾ gal.	
		15% Toxaphene plus 5% DDT plus Parathion 2%	15–20	25–30	
		Phosdrin EC 2 lbs. per gal.	1 pt.	1 pt.	
		2% Parathion dust	20	30	
		Parathion EC 2 lbs. per gal.	2–3 qts.	2–3 qts.	Parathion and Dibrom. Do not apply after edible parts start to form
		Dibrom EC 8 lbs. per gal.	1–2 pts.	1–2 pts.	
	Crickets	10% Chlordane dust	15–18	20–30	When crickets start appearing in newly planted fields of fall vegetables
		Apple peel baits	10–12	10–12	
		20% Toxaphene dust	No	20–30	
		2% Dieldrin dust	15–18	20–30	
	Cutworms	20% Toxaphene dust	15–20	No	When injuring plants in seedling stage
		10% DDT	15–20	No	
		2% Dieldrin dust	15–20	No	
		Apple bait	10	10	
	Cabbage Aphid and False Turnip Aphid	5% Malathion dust	20	25	Malathion 3 days before harvest.
		57% Malathion EC 5 lbs. per gallon	1 qt.	1 qt.	
		Demeton (Systox) EC 2 lbs. per gallon	1 qt	1 qt.	Demeton 21 days before harvest.
		2% Parathion dust	15–25	25–30	Parathion 21 days before harvest.
		Parathion EC 2 lbs. per gal.	3–4 pts.	3–4 pts.	
		Dibrom EC 8 lbs. per gal.	1 pt	1 pt.	Dibrom 4 days before harvest
		Phosdrin EC 2 lbs. per gal.	1 pt	1 pt	Phosdrin 4 days before harvest
		3% Diazion plus 60% sulfur	15	15	Diazinon 7 days before harvest
		Nicotine-sulfate 40%	1½– pts.		Nicotine 7 days before harvest
		50% Thiodan wettable powder	1–1.5 lbs.		Do not apply after edible parts form

Crop	Insect	Insecticide	Pounds Per Acre (Ground)	Pounds Per Acre (Air)	Remarks and Limitations
Broccoli, Brussels Sprouts, Cabbage, Cauliflower and Radish, Turnips, Mustard	Spider Mites	Dusting sulfur Systox (Demeton) EC 2 lbs. per gallon	25–30 1.5 pts.	25–30 1.5 pts.	Begin treatments when mites start to cause injury. Do not use Systox within 21 days before harvest.
	Harlequin Cabbage Bugs	20% Sabadilla dust 1% Lindane 1% Rotenone	18 18 18	20–30 30 30	When insects are injuring plants.
	Flea Beetles	10% DDT	12–15	20–25	Start controls when flea beetles injury appears in injurious proportions.
Carrots	Tulip Aphid	Parathion EC 2 lbs. per gal. Methyl Parathion EC 5 lbs. per gallon	2 qts in 50 gals. water 1.5 pts. in 50 gals. water	 No	Do not use within 21 days before harvest. Apply along row with nozzles just above crowns
	Vegetable Weevils	57% Malathion EC 5 lbs. per gallon 5% Malathion dust	1–1.5 pts in 50 gals. water 20–30	No No	Same application method as for Aphid Do not use within 7 days before harvest.
Egg Plants	Flea Beetles	10% DDT dust	12–15	30–40	Start controls when the flea beetle injury appears serious.
	Lace Bugs	1% Rotenone dust 5% Malathion dust	12–15 15–20	20–25 20–25	Start when the insects appear in harmful numbers.

Melons, Cantaloups, Watermelons, Honeydews, Etc.	Aphids	5% Malathion dust	15	25	Malathion 1 day before harvest
		57% Malathion EC 5 lbs. per gallon	1–1.5 pts.	1–1.5 pts.	
		2% Parathion dust	20–25	30	Parathion 15 days before harvest.
		40% Nicotine sulfate sprays	1.5 pts	1.5 pts.	
		Demeton (Systox) EC 2 lbs. per gallon	1.5 pts.	1.5 pts.	Demeton 21 days before harvest
		2% Phosdrin dust	15	25	Phosdrin 14 days before harvest
		3% Thiodan dust	25	30	Thiodan 14 days before harvest
		Thiodan EC 2 lbs. per gal.	1 qt.		
	Thrips	5% Malathion dust	15–18	20–30	Start controls when leaves start showing a silvery appearance.
		57% Malathion EC 5 lbs. per gallon	1½ pt. in 6–8 gal. water		
		2% Parathion dust	15–18	20–30	Parathion 7 days before harvest
		Parathion EC 2 lbs. per gal	1 qt. in 6–8 gal. water		
	Darkling Ground Beetles and Crickets	10% Chlordane dust	20	No	When injury noticed on seedling plants or to melons. Chlordane, do not apply after edible parts begin to form.
		10% DDT dust	20	No	DDT use early, 5 days before harvest.
		2% Dieldrin dust	10–20		Dieldrin do not apply after blossoming starts
		Dieldrin 1.5 lbs. EC per gal.	1 qt.	1 qt.	
		Apple-peel bait	10	No	
	Serpentine Leaf Miners	2% Parathion dust	20	25	Parathion 7 days before harvest
		4% Ethion dust	20	30	
		Ethion EC 4 lbs. per gal.	30–40	30–40	Ethion 7 days before harvest
	Omniverous Leaf Roller	2% Parathion dust	20–30	20–30	7 days before harvest

Crop	Insect	Insecticide	Pounds Per Acre (Ground)	Pounds Per Acre (Air)	Remarks and Limitations
Melons, Cantaloups, Watermelons, Honeydews, Etc. (cont'd)	Cucumber Beetles	50% Cryolite dust 5% Malathion dust 2% Parathion dust 5% Methoxychlor dust	12–15 15–20 15–18 12–15	20–25 20–25 20–30 20–25	NEVER use **sulfur or toxaphene dust on melons.** Start controls when the beetles are causing injury to the plants There may be spotted, striped, or belted beetles that cause injury Malathion—1 day before harvest Parathion—7 days Methoxychlor—1 day
	Red Spiders or Spider Mites	4% Ethion dust Ethion EC 4 lbs per gal 2% Parathion dust Demeton (Systox) EC 2 lbs per gallon 3% Kelthane dust	30–40 1 qt 20–30 1 5 pts 20–25	30–40 1 qt 20–30 1 5 pts 20–25	Ethion 7 days before harvest Parathion 7 days before harvest Demeton 21 days before harvest Kelthane dust 2 days before harvest
	Flea Beetles	5% Malathion dust	20–25	20	1 day before harvest
	Grasshoppers	Apple-peel baits 10% Chlordane dust	10 12 15		Control when hoppers start feeding on the rinds Do not dust fru
	Leafhoppers	2% Parathion dust	20–25	20–25	When present 7 days before harvest
Squash	Squash Vine Borer	1% Rotenone dust	18	25	When injury first shows up Locate where attack appears by yellowish excrement on vine Remove borer with knife Pull soil over cut area to prevent drying and encourage resprouting

	Squash Bug	20% Sabadilla dust 1% Rotenone dust 1% Lindane dust	18–20 18–20 18–20	25–30 25–30 18–20	Start controls when adults and eggs first appear in numbers. Never use DDT on squash.
	Aphids or Plant Lice	5% Malathion dust 57% Malathion EC 5 lbs. per gallon Demeton (Systox) EC 2 lbs. per gallon 2% Parathion dust Parathion EC 2 lbs. per gal.	18–20 1 to 1½ pts 1 pt. 18–20 ½ to 1 lb. technical	25–30 1 pt. 25–30	Start controls when the aphid infestations appear at several points in the field. Demeton 21 days to harvest Parathion 15 days before harvest.
	Beet Leafhoppers	2% Parathion dust	20–25	20–25	When present 15 days before harvest.
	Squash Capsids	1% Rotenone dust	15–18	20–25	When they appear in injurious numbers start control.
	Cucumber Beetles	50% Cryolite dust 2% Parathion dust	18 18	30 20	Wash or brush residue from fruit. Parathion 15 days before harvest.
Sweet Corn	Sweet Corn Flea Beetles	10% DDT dust 5% Malathion dust	12–15 12–15	20–25 20–25	Start controls when the beetle injury starts to appear on the small plants.
	Corn Earworms	7.5% Sevin dust	20	30	Apply with hand duster to each ear or by airplane. Apply at 2-3 day intervals, when silks first begin to appear. You may use hand treatment and use less dust per acre. No restrictions for ears for humans. For dairy or other animals 7 days before harvest.

Crop	Insect	Insecticide	Pounds Per Acre (Ground)	Pounds Per Acre (Air)	Remarks and Limitations
	Corn Earworms	10% DDT dust	30	No	Do not feed fodder to livestock Apply to each ear with dauber type brush and start when silks first appear 3 to 4 applications at 3 day intervals
	Seed Corn Maggots	75% Lindane wettable powder	1⅓ oz to 100 lbs of seed		Apply materials as a slurry to seed before planting Endeavor to plant corn in well drained soil Avoid planting too early
		75% Dieldrin wettable powder	⅓ to ⅔ oz per 100 lbs of seed		
		75% Heptachlor wettable powder	⅓ to ⅔ oz per 100 lbs of seed		
	Spider Mites	325-mesh conditioned dusting sulfur	20–25	30	Start controls when the spider mites start to fire the plants
		5% Malathion dust	25	30–35	
	Lesser Cornstalk Borer	3% Aldrin Granular	15–35	No	Apply all materials in furrow along with seed at planting time only
		Aldrin EC 2 lbs per gal	1–2 qts		
		2 5% Haptachlor Granular	20–40		
		Heptachlor EC 2 lbs per gallon	1–2 qts		
		2% Endrin Granules	20–40		
		Endrin EC 1 6 lbs per gal	1–2 qts		
		2% Dieldrin Granules	25–50		
		Dieldrin EC 1 5 lbs per gal	⅓–⅜ gal		

Sweet Corn (cont'd)	Southwestern Corn Borers	No chemical control			Fall plow in order to turn the base of the stalks out on top of the soil as the worm spends the winter in the top of the roots.
	Fall Armyworms	15% Toxaphene plus 5% DDT dust	15–20	25–30	On late summer or fall planted sweet corn this insect can destroy the crop if dustings are not applied when the worm first appears. Do not feed refuse to dairy animals or animals for slaughter.
White Potatoes	Leafhopper	5% DDT plus 60% sulfur dust	30	35	
		Demeton (Systox) EC 2 lbs. per gallon	1.5 pts.	1.5 pts.	Demeton 21 days before harvest.
		5% Malathion dust	15	30	Malathion 1 day before harvest.
		3% Thiodan dust plus 25% sulfur-bentonite mixture	30	35	Thiodan 14 days before harvest.
		Thiodan EC 2 lbs. per gal.	1–2 qts.		
	Flea Beetles	3% Thiodan dust plus 25% sulfur-bentonite mixture	15	30	Thiodan 14 days before harvest.
		10% DDT dust plus sulfur	20	30	1 day before harvest.
		5% Malathion dust	20	30	1 day before harvest.
	Aphids	2% Parathion dust	20	30	5 days before harvest.
		5% Malathion dust	20	30	1 day before harvest.
		Demeton (Systox) EC 2 lbs. per gallon	1 pt.	1 pt.	21 days before harvest.
		Phorate (Thimet) Granules 10%	20	No	Plants—pre-emergence application only.
		40% Nicotine Sulfate	1–2 pts. in 50 gal. of water—ground only		
		3% Thiodan dust	30	35	14 days before harvest.

Crop	Insect	Insecticide	Pounds Per Acre (Ground)	Pounds Per Acre (Air)	Remarks and Limitations
White Potatoes	Psyllids	10% DDT plus 60% sulfur Phorate (Thimet) 10% Granules Thiodan EC 2 lbs. per gal. 325-mesh dusting sulfur Wettable sulfur	15 20 0.5 30 8–10	30 No 0.5 35 No	When nymphs show up on the lower leaves. Plants—Pre-emergence application only. Apply in band on one or both sides of seed row at planting Thiodan 14 days before harvest.
	Blister Beetles	50% Cryolite dust 2% Dieldrin dust	15 20	30 30	When beetles show up 21 days before harvest.
	Potato Stalk Borers	Do not plant potatoes in late Spring or in poor soil.			
	Potato Ruber Moth	3% Thiodan dust	18	30	1 day before harvest. Do not plant in soil where moth is present.
Sweet Potatoes	Salt Marsh Caterpillars				It is best to put a barrier of aluminum foil around the fields to prevent migration into sweet potato fields.
Peas	Aphids or Plant Lice	10% DDT dust 5% Malathion dust Demeton (Systox) EC 2 lbs. per gallon	12–15 12–15 1 pt.	20–30 20–30 1 pt.	Start controls when a few infestations appear in the field. Sometimes the aphids are controlled by parasites and predators. Do not apply DDT to edible pod varieties. Malathion 3 days before harvest. Do not feed foliage to livestock.

Peas (contd)	Flea Beetles	10% DDT dust	15	20–25	When holes and beetles start appearing, start controls. Do not apply DDT to edible pods.
	Spider Mites	2% Parathion dust	12–15	25–30	When leaves start losing color and mites are numerous you should start controls.
	Leaf Miner	2% Parathion dust	18	30	10 days before harvest
	Thrips	2% Parathion dust 10% DDT dust	15–20 15–20	25 25	Parathion 10 days before harvest. Do not apply DDT to edible pod varieties.
Peppers	Hornworms	20% Toxaphene dust 10% DDT dust 30-50% Cryolite dust	15 15 18	30 30 30	When worms first appear. Toxaphene 5 days before harvest. DDT—5 days before harvest. Do not apply within 30 days of harvest. Wash fruit treated with Cryolite.
	Cutworms	20% Toxaphene dust 10% DDT dust	15 15	25 25	Use on seedling plants only.
Onions	Thrips	2% Dieldrin dust Dieldrin EC 1.5 lbs. per gal. 20% Toxaphene dust Toxaphene EC 6 lbs. per gal. Parathion EC 2 lbs. per gal. 2% Parathion dust	15–20 ⅓–⅔ gal 20 ⅓ gal. per acre 1 qt. 25	25–30 25–30 1 qt. 30	Dieldrin—Seed and dry onions only 14 days before harvest. Do not use Toxaphene on green onions. Parathion—Do not opply to green or dry or seed onions within 20 days of harvest.

Crop	Insect	Insecticide	Pounds Per Acre (Ground)	Pounds Per Acre (Air)	Remarks and Limitations
Onions (cont'd)	Seed Corn Maggots	75% Lindane wettable powder	1⅓ oz. per 100 lb. seed		Use as a slurry treatment on seed shortly before planting.
		75% Dieldrin wettable powder	⅔ oz. per 100 lb. seed		
		75% Heptachlor wettable powder	⅔ oz. per 100 lb. seed		
		8% Ethion Granular	10 lbs.		Apply at planting time to 36 inch rows.
Tomato	Hornworms and Fruitworms	10% DDT plus 50% sulfur	20	30	5 days before harvest.
		5% TDE or DDT dust	25	35	1 day before harvest.
		50% Cryolite dust	15	25	Remove excess residue by washing or brushing.
		Dibrom EC 8 lbs. per gal.	1 pt.	1 pt.	4 days before harvest.
		20% Toxaphene dust	15	25	5 days before harvest.
	Russet Mites	10% DDT plus 50% sulfur	18	30	Do not use sulfur DDT on small plants. The past history of mites start when plants were established.
		325-mesh conditioned sulfur dust	18	30	
	Red Spider or Spider Mites	325-mesh conditioned dusting sulfur.	18	30	

Tomato (cont'd)	Psyllids	Wettable sulfur 10% DDT plus 50% sulfur Thiodan EC 2 lbs. per gal.	6–8 20 1–2 qts.	No 30	Apply when Psyllids first appear. DDT—7 days before harvest. 14 days before harvest.
	Flea Beetle	10% DDT plus 50% sulfur	20	30	5 days before harvest.
	False Chinch Bugs	1% Lindane dust 5% Malathion dust 4% Ethion dust	30 30 25	 25	Lindane—do not apply after fruit starts to form. Malathion—1 day before harvest. Ethion—7 days before harvest.
	Stink Bugs	Thiodan EC 2 lbs. per gal. 3% Thiodan dust	1 qt. 20	 20	7 days before harvest.
	Leaf Miners	2% Parathion dust	18	25	
	Blister Beetles	50% Cryolite dust 2% Dieldrin dust	15–18 20	20–25 20	Start controls when they appear in injurious numbers.
	Aphids				Generally aphids do very little damage to tomatoes. Best controls with 5% Malathion dust.
Okra	Cutworms	20% Toxaphene 10% DDT	15–18 15–18	20–25 20–25	Start controls when the injury appears.
	Bollworms	10% DDT and sulfur	15–18	20–25	Start controls when worms are injuring the pods.

Crop	Insect	Insecticide	Pounds Per Acre (Ground)	Pounds Per Acre (Air)	Remarks and Limitations
Strawberries	Red Spider or Spider Mites	18.5% Kelthane wettable powder 2 lbs. technical per acre	2 lbs. per acre in 100 gals. of water		2 days before harvest
		4% Ethion dust	25	30	Do not apply within 14 days of harvest on Ethion.
		325-mesh conditioned sulfur dust	18	25	3 days before harvest.
		Demeton (Systox) EC 2 lbs. per gallon	½ pt. per 100 gals. water		
		Thiodan EC 2 lbs. per gal.	1 qt.		8 days before harvest.

TYPES OF FORMULATIONS

Dusts

Most insecticide dusts contain an inert carrier, such as pyrophyllite, certain type clays, etc. Each minute particle is coated with a chemical that is toxic to insects. Dusts may be applied by many types of dusters from simple dust guns to large, power dusters.

Dusts usually are less likely to injure plants than sprays. They are not generally absorbed through the skin but may be dangerous when inhaled through the respiratory passages.

Wettable Powders

Wettable powders contain a toxic ingredient (like DDT) blended with an inert dust. A wetting agent is added to enable the powder to better mix with water. This forms a suspension rather than a solution, as the fine particles are suspended in the water and not dissolved.

Suspended materials will settle to the bottom of the container or sprayer if some means of agitation is not used. Some wettable powders settle out more rapidly than others.

Wettable powders are less likely to injure plants than emulsions, but are more likely to clog up spray equipment.

Emulsifiable Concentrates

An emulsifiable concentrate can be made by dissolving a technical grade insecticide like chlordane in a solvent and adding an emulsifier. Concentrates usually contain from 20% to 75% actual insecticides. They are mixed and diluted with water to form finished emulsion sprays.

Emulsion sprays do not settle out as rapidly as wettable powders. Consequently, they are preferred for use in sprayers with no agitators. Emulsions are more likely to injure plants than wettable powder sprays due to the solvents, emulsifiers, etc.

Granular Insecticides

Granules are larger particles than dusts of various carriers treated with a toxic chemical (like chlordane, aldrin, toxaphene, etc.). Granules are usually made to pass a 30-60 mesh screen. They are used primarily at present to control soil insects. Granules roll off vegetation and do not stick like dusts and sprays.

Aerosols

Aerosols are composed of a number of fine liquid particles suspended in air. They may be produced by liquefied-gas formulations released through capillary or expansion-chamber nozzles; by steam or air-atomization of liquid; by spinning discs and rotors; by forcing liquid under high pressure through atomizing nozzles; by heat vaporization; or by a combination of these methods.

Smokes

Smokes are clouds of insecticidal particles produced by heat. Particle size is less than one-tenth micron. Smokes are similar to aerosols in their uses and properties.

COMPATIBILITY OF PESTICIDES

It is preferable to apply insecticides and fungicides separately. Because of differences in solvents, emulsifiers and wetting agents, various formulations may be incompatible even though the basic materials are compatible.

In general, (a) mix liquid with liquids, (b) mix wettable powders with wettable powders, and (c) use materials of the same brand if possible.

A mixture of spray chemicals may be considered to be compatible if the different materials work together satisfactorily from the chemical, physical and biological standpoints.

If a mixture is compatible, (a) the effectiveness of each material in the mixture will not be reduced in any way, (b) the combination must not be harmful to the plants by producing chemical burns, reducing growth or yields, or causing other injury, and (c) the materials must mix readily and give no difficulty in operation and maintenance of the sprayer.

PHYTOTOXICITY

A pesticide or mixture of pesticides may cause injury to certain plants. The condition under which the injury occurs may vary considerably depending upon temperature, humidity, and other environmental factors.

Many of the newer pesticides and some of the older ones have not been adequately tested on numerous plants, particularly ornamental shrubs and flowers. If a material that appears promising against a particular pest or group of pests has not been thoroughly tested from the standpoint of effectiveness and possible plant injury and a grower wishes to try it, the material should be applied first to only a few plants. See if it controls the pest and does not injure the plant. Be sure to satisfy yourself as to the tolerance of the particular plants to be treated.

Accuracy of dosage with modern chemicals is essential. Correct amounts of the insecticides are necessary to minimize the danger of plant injury and to insure effective control.

CAUTIONS IN USE OF PESTICIDES

Insecticides are nearly always poisonous to humans, and various ones may be released before their hazards are completely understood.

Handle the materials with great care, especially the concentrated forms.

ALWAYS READ INSECTICIDE LABELS CAREFULLY AND COMPLETELY. IT IS FOR YOUR BENEFIT AND PROTECTION. Labels on packages of pesticides should show the kinds and amounts of active ingredients. They should indicate whether the materials are poisonous and state clearly what precautions must be taken to handle and use them safely. And the label should give the antidote. It should also give the proper antidote to use in case of accidental poisoning.

INSECTICIDES USED

Aldrin

Uses: Soil insects including white grubs, cutworms, mole - crickets, wireworms, etc.; cotton insects; grasshoppers. Kills by contact and stomach poison; some vapor action.

Formulations: 25% wettable powder, 2½% and 5% dusts, 5 and 10% granules, emulsifiable concentrate containing two pounds active ingredient per gallon (about 23%).

Chlordane

Uses: Grasshoppers, plant bugs, soil insects including: ants, white grubs, cutworms, wireworms, sowbugs, pillbugs, etc.; used in snail baits extensively in household pest control; lice, ticks, hornflies and mange mites of livestock, chiggers and termites. Kills by contact, stomach poison and some vapor action.

Formulations: 2 to 3% kerosene solutions for household pests; emulsifiable concentrates ranging from about 44% to 78% by weight; 40% and 50% wettable powders; 5% and 10% dusts; 5% and 25% granules.

DDD (TDE)

Uses: Similar to DDT except not as wide and not as effective against certain insects. Widely used for control of hornworms and fruitworms on tomatoes, and budworms on tobacco. Not widely used on ornamentals. Not as toxic to operators as DDT. Kills by contact and stomach poison.

Formulations: 50% wettable powders; 25% emulsifiable concentrate (2 lbs. actual per gallon); 5 and 10% dusts.

DDT

Uses: One of most widely used insecticides on vegetables, forage and cover crops, cotton, peanuts, tobacco, and ornamentals, livestock. It is also used for lawn and turf insects control including chinch bugs, sod webworms, armyworms, leafhoppers. Kills by contact and stomach poison; no vapor action.

Formulations: 5, 10 and 15% dusts; 25% emulsifiable concentrate (2 lbs. actual per gallon); 50% and

75% wettable powders; aerosols, smokes; 5% kerosene solutions for household use.

Demeton (Systox)

Uses: Systemic pesticide for aphids and spider mites. Also has proven effective against whiteflies, certain armored and soft scales. Absorbed through roots and young foliage and carried in sap stream. Also kills by contact and fumigant action when used as foliage spray. Has been used successfully on many vegetables, roses, mums, azaleas, gardenias, hibiscus, Easter lilies, camellias, and several other plants.

Formulations: Emulsifiable concentrate containing 2 lbs. actual per gallon is most common.

It is very poisonous and extreme caution should be followed.

Dieldrin

Uses: Cotton insects, grasshoppers, excellent for thrips control on ornamental plants like mums and gladiolus; thrips on subtropical fruits; soil inhabiting insects like ants and cutworms. Used in mosquito control and for household pests and termites. Kills by contact and stomach poison.

Formulations: 25 and 50% wettable powders; emulsifiable concentrate containing 1.5 lbs. per gallon (about 18.5%); 25% dust concentrate; 1.5% and 2.0% dusts; 2% and 5% granules.

Diazinon

Uses: Phosphate insecticide used for resistant houseflies. Shows promise against some pests on agricultural crops, also for lawn and flower insects.

Formulations. 25% wettable powder; 25% emulsifiable concentrate (contains 2 lbs. per gallon), also a 12.5% emulsifiable concentrate for home use.

Endrin

Uses: Endrin is a stereoisonner of dieldrin. Used against cotton insects; and cutworms.

Formulations: 2% dust; 2% granules; emulsifiable concentrate containing 1.6 lbs. per gallon (about 19%); 25% wettable powder.

Lead Arsenate (Standard)

Uses: Chewing insects on wide variety of crops. Kills as stomach poison. Largely replaced by newer organic insecticides.

Formulations: Wettable powders and pastes.

Malathion

Malathion is a phosphate insecticide related to parathion, but less toxic to humans.

Uses: Aphids, thrips, scales, whiteflies, mealybugs, house flies, fleas, Mexican bean beetles. Widely used on ornamentals. Kills mites but not their eggs. Kills by contact, stomach poison, and some vapor action.

Formulations: 4%, 5%, and 10% dusts; 25% wettable powders; 57% emulsifiable concentrate (5 lbs. actual per gallon).

Metaldehyde

Uses: Control of slugs and snails; combined with chlordane as 10% metaldehyde and 5% chlordane or used alone as 15% dust; used in baits as attractant with calcium arsenate.

Formulations: 15% dusts; in baits with other toxicants.

Methoxychlor

Methoxychlor is related to DDT, but is much safer to use.

Uses: Effective against a wide range of insects including hornflies, animal lice, fleas, Mexican bean beetles, cucumber beetles, household pests.

Formulations: 50% wettable powder; 25% emulsifiable concentrate (2 lbs. actual per gallon); 5% and 10% dusts; aerosols.

Nicotine

Uses: Control of aphids and other soft bodied insects. Except for small growers it has been largely replaced by newer materials.

Formulations: Nicotine sulfate (40%); crude alkaloid (95%); dusts, smokes.

Ovex

Ovotran, Orthotran, Niagaratran are some trade names.

Uses: Primarily to control mite eggs and newly hatched mites, of little value as an insecticide or even as a control of adult mites. Has long residual. Used on cotton, citrus (purple and six-spotted mites), ornamentals and some sub-tropical fruit trees.

Formulations: 50% wettable powders most common; 25% emulsifiable concentrate; dusts; aerosols.

Parathion

Parathion is a phosphate insecticide that should be handled with extreme care. One of our most versatile pesticides.

Uses: Aphids, thrips, scales, mealybugs, many caterpillars, plant bugs, peach insects. Widely used on ornamentals, tobacco, citrus, vegetables, sub-tropical fruits. Kills mites but not their eggs. Used in combination with DDT on numerous crops against a very wide range of insects. Kills by contact, vapor and stomach poison.

Formulations: 15% and 25% wettable powders; 1% and 2% dusts; 25% emulsifiable concentrate (2 lbs. actual per gallon) and 42% emulsifiable (4 lbs. actual per gallon); granules.

Pyrethrum

Made by the grinding or extraction of the dried flowers of CHRYSANTHEMUM CINERARIAEFOLIUM. Extracts have largely replaced the ground flowers. Gives quick knock-down, breaks down rapidly.

Uses: Primarily in stored grain sprays and dusts, household sprays and aerosols, and for livestock pests. Often mixed with other insecticides to give quick knockdown. Used to some extent in ornamental and vegetable garden dusts and sprays. Also an ingredient in many flea and lice powders. Pyre-

thum is of very low toxicity to humans.

Formulations: 4% and 5% wettable powders; 0.75% and 1.5% dusts.

Sulfur

Sulfur is a well known fungicide and miticide with a low order of toxicity to humans but irritating to the eyes.

Uses: Control of citrus rust mite on citrus. Also effective against a few other mites and insects. Largely being replaced for mite control on ornamentals and other crops by newer organic materials.

Toxaphene

Toxaphene is a chlorinated camphene.

Uses: Widely used on cotton insects, grasshoppers, armyworms, sod webworms, cutworms, stink bugs. Also used on many vegetables. It is generally good for lepidopterous larvae (caterpillars). Kills by contact, vapor, and stomach poison.

Formulations: 25% and 40% wettable powders—40% most common; 5%, 10% and 20% dusts, emulsifiable concentrates containing 2, 4, 6 or 8 lbs. toxaphene per gallon. Probably most common is emulsifiable concentrate containing 6 lbs. toxaphene per gallon (about 60%); 2 to 2½% baits, 10% and 20% granules.

Lindane

(Pureform of Benzene Hexachloride)

Uses: Soil insects attacking seeds by treating seeds prior to planting with lindane and fungicide. It is also approved for control of several vegetable insects. It is also effective on livestock and household insects

Formulations: 25% to 75% wettable powder, emulsion concentrate 1.6 pounds per gallon and 1% and 3% dusts.

Ethion

Is a rather new insecticide formerly known as Niagara 1240. It is principally aerocide of the phosphate group. It is classified as moderately to highly toxic. It is sold in 25% wettable powder, 50% wettable powder for seed treatment, emulsion concentrate containing four pounds per gallon, a 4% dust, 5% and 8% granules and an ethion emulsifiable oil containing 2% ethion and 95% superior type oil for pre-bloom sprays for tree fruits.

Thiodan

This is a rather new chlorinated fused ring insecticide that has looked good for control of potato, tomato, crucifer and bean insects. It has also looked good on some fruit insects and mites. It is sold in a 25% to 50% wettable powders, emulsion concentrate containing 2 pounds per gallon, dusts of 3% and 4% and a 4% granular. It is considered poisonous and user should wear rubber gloves and a mask. Wash hands thoroughly when through using.

QUANTITY OF COMMERCIAL FORMULATION NEEDED TO PROVIDE EXACT AMOUNTS OF TECHNICAL INSECTICIDES PER ACRE

Insecticide Formulation. (% by weight of actual chemical)	⅛ pound technical	½ pound technical	¾ pound technical	1 pound technical	1½ pounds technical	2 pounds technical	3 pounds technical	5 pounds technical
15-20% Emulsifiable concentrate (1½ lbs. per gal.)	⅓ quart 10⅔ fl. ounces	1⅓ quarts	2 quarts	2⅔ quarts	1 gallon	5⅓ quarts	2 gallons	3⅔ gallons
23-25% Emulsion concentrate. 2 lbs. per gallon	½ pint (1 cup)	1 quart	1½ quarts	2 quarts	3 quarts	1 gallon	1½ gallons	2½ gallons
42-50%. 4 pounds per gallon	¼ pint (4 fl. oz.)	1 pint	1½ pints	1 quart	1½ quarts	2 quarts	3 quarts	5 quarts
60-65%. 6 pounds per gallon	1/6 pint 2⅔ oz.	⅔ pint	1 pint	1½ pints	2 pints	2⅔ pints	2 quarts	3⅓ quarts
72-80%. 8 pounds per gallon	⅛ pint 2 fl. oz.	½ pint	¾ pint	1 pint	1½ pints	1 quart	1½ quarts	2½ quarts
15% Wettable powder	13½ oz.	3½ lbs.	5 pounds	6⅔ pounds	10 pounds	13½ lbs.	20 pounds	33⅓ lbs.
25% Wettable powder	½ pound	2 pounds	3 pounds	4 pounds	6 pounds	8 pounds	12 pounds	20 pounds
40% Wettable powder	5 ounces	1¼ lbs.	1⅞ pounds	2½ pounds	3¾ pounds	5 pounds	7½ pounds	12½ lbs.
50% Wettable powder	¼ pound (4 ounces)	1 pound	1½ pounds	2 pounds	3 pounds	4 pounds	6 pounds	10 pounds

This publication is issued by The Cooperative Extension Service and The Agricultural Experiment Station of The University of Arizona. See your local County Extension Agent for additional information.