Controls for Vegetable Insects

FOR COMMERCIAL PRODUCERS

Circular 239

Agricultural Extension Service, University of Arizona

Controls For Vegetable Insects For Commercial Producers

By
J. N. Roney, Extension Entomologist
Ray L. Milne, Assistant County Agent, Maricopa County

Crop	Insect	Insecticide	Pounds per Acre		Remarks
			Ground	Air	
Asparagus	Cutworms	10% Toxaphene dust 5% DDT dust 2% Heptachlor dust Apple-peel bait	15 15 15 10	20 20 20 10	Apply when cutworms are injuring the stems. If stems are cut, be careful not to dust those ready for harvest.
Beets	Aphids	5% Malathion dust 57% Malathion Emulsion concentrate Nicotine sprays	12-15 1½ pts. per 30 gals. of water by ground 1 to 2 pts. per 25 to 100 gals. water	20	Start when aphids appear in injurious numbers. Many times parasites or predacious enemies keep these insects under control. Parasitized aphids will appear straw-colored.
	Beet Leafhopper	5% or 10% DDT dust DDT sprays	12-15 1.5 to 2 lbs. of technical DDT	15-20	When leafhoppers first appear on seedling plants.
	Beet Armyworm	5% or 10% DDT dust and 60%-70% sulfur dust DDT sprays	15-18 1.5 to 2 lbs. of technical DDT per acre	20-30	When injury becomes noticeable.

Cabbage Looper	15% Toxaphene, 5% DDT dust mixture Toxaphene-DDT emulsion spray 5% Malathion 2.5% Heptachlor	15-18 25-30 3 lbs. toxaphene and 1.5 lbs. DDT in 6-8 gals. 20 25-30 25-30 25-30	Where eggs or worms first appear on the small seedlings. Do not apply **any insecticides** 30 days prior to harvest. For use just before harvest. Only fair results.
Stink Bugs (several species)	20% Toxaphene dust 40% Sulfur dust Toxaphene emulsion spray	20-25 30-40 7 gals. per acre same amount of technical material as dust	When 3 to 4 stink bugs per 100 sweepings of a bug net are present.
Lygus Bugs	2% Dieldrin dust Dieldrin spray	15 20 ½ lb. technical ½ lb. technical	When 4 to 8 lygus per 100 strokes.
Salt Marsh Caterpillar	15% Toxaphene 5% DDT and sulfur dust mixture. If this mixture fails, use parathion spray. Aluminum foil barriers around the fields 7 inches high also very effective when worms are migrating from other crops.	20 30-40 ½ lb. technical ½ lb. technical	When worms first appear.
Vegetable Weevil	5% Malathion dust 57% Malathion emulsion concentrate	15 18 1½ pts. 1½ pts.	When the beetle larvae or adults first appear.

Crop	Insect	Insecticide	Pounds per Acre		Remarks
			Ground	Air	
Beans (Snap or Pinto)	Bean Beetle	1% Rotenone dust 50% Cryolite dust	15-18 15-18	20-30 20-30	When the beetles appear in numbers and are injuring the foliage.
Black Eye Peas	Mexican Bean Beetle	5% Malathion dust 57% Malathion emulsion concentrate	12 15 1½ pts. in 7-10 gals. water	18-25 Same as for ground	This insect feeds on the underside of the leaves and all insecticides must be applied accordingly if controls are to be secured. **DDT will not kill** this insect.
	Flea Beetles	10% DDT dust 1% Rotenone dust	15 15	20-25 20-25	Start controls when small beetles and little holes start to appear in the leaves.
	Corn Earworm	10% DDT dust	15-18	20-25	When the eggs start appearing on blooms or growing tips of plants.
	Lesser Cornstalk Borer				Cultural controls are the only methods at the present. Some promising results have been secured with chlordane and aldrin dusts applied to seeds and on top of row just after planting at rate of 10 lbs. per acre.
	Seed Corn Maggot	2.66 oz. 75% Wettable Powder Lindane to 100 lbs. of seed			Apply at time of planting the seed or shortly before.

	Stink Bugs	15% Toxaphene, 5% DDT	15-18	20-25	When the stink bugs start injury to pods.
Broccoli, Cabbage, Cauliflower, Lettuce, Brussels Sprouts, Endive, Romaine, Mustard, Turnips, Radishes, Swiss Chard	Several species of cabbage worms (imported cabbage worm), yellow striped army worm	10% DDT dust 15% Toxaphene & 5% DDT dust mixture 50% Cryolite dust 1% Rotenone dust DDT Emulsion sprays or wettable powders Toxaphene-DDT sprays	15-18 15-18 15-18 15-18 1 to 1½ lbs. technical DDT in 3 to 6 gals. of water 1¾ to 4 lbs. technical toxaphene & 1 to 2 lbs. DDT in 3 to 6 gals. of water	20-25 25-30 25-30 20-30	Start controls on seedling plants when eggs first appear. On older plants when either eggs or worms appear in injurious numbers. Never drive ground equipment over 6 miles per hour. Do **not** apply any of the materials listed except roterone 30 days prior to harvest.
	Cabbage Looper	15% Toxaphene dust (for Salt River Valley) 15% Toxaphene & 5% DDT dust (this is for Yuma area and where other worms are a problem) Dieldrin spray or dust	15-18 15-18 ½ lb. technical	20-25 20-25 ½ lb. technical	Start controls on seedling plants when eggs first appear. On older plants start controls when worms appear. Sometimes a worm infestation may be destroyed by a disease that often appears.
	Harlequin Cabbage Bug	20% Sabadilla dust 1% Rotenone dust	15-18 15-18	20-30 20-30	Start applications when the insects appear in injurious numbers.

Crop	Insect	Insecticide	Pounds per Acre Ground	Pounds per Acre Air	Remarks
Broccoli, etc. (cont'd)	Crickets	10% Chlordane dust Apple-peel baits 20% Toxaphene dust 2% Dieldrin dust Heptachlor-spray emulsion	15-18 10-12 No 15-18 3-4 oz. technical	20-30 10-12 20-30 20-30 0	When crickets start appearing in newly planted fields of fall vegetables.
	Spider Mites	325-mesh conditioned sulfur will work on most species	25-30	25-30	When spider mites are causing injury.
	Cabbage Aphids also False Turnip Aphids	5% Malathion dust 57% Malathion emulsion concentrate Nicotine sprays	12-15 1 pt. in 6-10 gals. water 1-2 pts. in 25-40 gals. of water	20-25	Start when about 5 to 7 plants out of 100 are infested with small colonies. Sometimes an infestation can be destroyed by parasites and predators. Parasitized aphids turn a straw color.
	Salt Marsh Caterpillars				Aluminum foil barriers 7 inches tall around planted fields give best protection. Second best: sometimes meat wrapping paper also works well. If an infestation develops in a field use ½ lb. per acre of Parathion in a spray of 4 to 8 gallons of water.
	Cutworms	10% DDT dust 10% to 20% Toxaphene dust	12-15 12-15	20-25 20-25	Apply insecticides when the cutworms cause injury to the plants.

		2½% Heptachlor dust 10% Chlordane	12-15 20	15-20 20	
	Flea Beetles	10% DDT	12-15	20-25	Start controls when the flea injury appears in injurious proportions.
Carrots	Tulip Root Aphids	Parathion Sprays			¾ pound with ground equipment 100 gallons per acre when aphids appear. Usually cause injury when too much dirt is pushed around the crowns of the plants. Add 12 to 15 oz. dreft to the above mixture.
		2% Parathion dust	20-25	No	Apply with ground equipment.
Celery	Celery Leaf Tier	5% DDT dust and sulfur mixture	20-25	30-35	Start controls as soon as the insects appear.
		Pyrethrum dusts 1.3% Pyrethrins	20-30	30-40	Dust the field, then turn around and redust for best control. This is a leaf miner and a double application is necessary if results are to be secured.
	Cutworms	10% DDT dust 10% Toxaphene dust 2½% Heptachlor dust Apple-peel or other poisoned baits	15-18 15-18 15-18 10-12	20-25 20-25 20-25 10-12	Start when the injury or worms appear in the fields. Usually one application will do the job.

Crop	Insect	Insecticide	Pounds per Acre Ground	Air	Remarks
Celery (cont'd)	Spider Mites	325-mesh conditioned sulfur dusts	15-20	25-30	Start controls when mites are causing discoloration or when they appear to be injuring the foliage.
		2% Parathion dusts	15-20	25-30	
		5% Malathion dust	15-20	25-30	
	Salt Marsh Caterpillar	15% Toxaphene, 5% DDT, 40% Sulfur dust mixture	15-20	30-40	Only use insecticides when eggs are hatching in fields. When worms start to migrate into fields place aluminum foil barriers around the entire area.
	Vegetable Weevil	5% Malathion dust	20-25	30-40	Start controls when either the larvae or adults first appear. Insecticidal treatment gives best control of larvae. Apply with ground equipment if possible.
		57% Malathion emulsion concentrate	1 to 1½ pts. in 15 to 20 gals. water	No	
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	12-15	20-25	Start when the insects appear in harmful numbers.
Melons, Cucumbers, Cantaloups, Watermelons, Honey Dew Melons, Persian, & Casaba	Cucumber Beetles	2½% Heptachlor	25-30		**Never** use sulfur dust on melons. Start controls when the beetles are causing injury to the plants. There may be the spotted, striped, or belted beetles that cause the injury.
		50% Cryolite dust	12-15	20-25	
		5% DDT dust (sometimes makes mites and serpentine leaf miner worse)	12-15	20-25	
		1% Rotenone dust	12-15	20-25	

Aphids or Plant Lice	5% Malathion dust 57% Emulsion Concentrate of Malathion Nicotine sulfate sprays 2% Parathion dusts Parathion sprays	18-20 25-30 1-1½ pts. 1½ pts. in 3-10 in 3-10 gals. of gals. of water water 1-2 pts. per 50 gals. water 18-20 30-35 1 pint 1 pint	Best controls are secured with spot treatments of infested plants when they first show up. Thorough applications of insecticides are needed. Sometimes infestations are controlled by presence of small parasites and predators. Parasitized aphids have a straw-colored appearance. **Be very careful** with parathion.
Thrips	5% or 10% DDT dust 5% Malathion dust 57% Malathion emulsion concentrate 2% Parathion dust Parathion spray	15-18 20-30 15-18 20-30 1½ pts. in 6-8 gals. water 15-18 20-30 .5 to 1 lb. in 6-8 gals. water	Start controls when leaves start showing a silvery appearance. Sometimes the DDT causes mite infestations to become bad.
Darkling Beetles	5% or 10% Chlordane dust 10% DDT dust 2% Dieldrin dust 2½% Heptachlor Dieldrin spray emulsion Apple-peel bait	15-20 No 15-20 No 10-12 No 10-12 No ½ lb. in 3 to 6 gals. water No 10 No	Start applications just after planting or just after plants emerge from the ground. Apply a mixture with ground machinery. Sometimes the beetles scar fruit just before harvest. Applications or insecticides or bait by hand or ground equipment may control the insects. Use 20% Toxaphene dust **30 days prior to harvest.**
Serpentine Leaf Miner	2% Parathion dust	12-15 20-25	Start controls when infestation appears to be causing severe injury to leaves of plants.

Crop	Insect	Insecticide	Pounds per Acre		Remarks
			Ground	Air	
Melons, etc. (cont'd)	Cutworms (on fruit)	10% DDT dust	12-15	No	Sometimes cutworms feed on the rinds of various melons. Usually spreading of insecticides or the baits by hand or by ground machinery gives best results.
		Apple-peel bait	10	10	
	Grasshoppers	Aldrin sprays	4 oz. in 6-10 gals. water		Control when the hoppers start feeding on the rinds.
		Apple-peel baits	10		
		10% Chlordane dust	12-15		
	Spider Mites or Red Spiders	2% Parathion dust	12-15	20-25	Start controls when mites start injuring the plants in several points in a field. More than one application may be necessary to get best control.
		2% Parathion plus 7½% Ovotran	15-18	20-30	
	Leafhoppers	Same as for Squash			
Squash	Squash Vine Borer	1% Rotenone dust 3 lbs. wettable methoxychlor per 100 gals. of water	15-18	20-30	When injury first shows up.
	Squash Bug	10% to 20% Sabadilla dust	18-20	25-30	Start controls when adults and eggs first appear in numbers.
		1% Rotenone dust	18-20	25-30	
	Aphids or Plant Lice	5% Malathion dust	18-20	25-30	Start controls when the aphid infestations appear at several points in the field.
		57% Malathion emulsion concentrate	1 to 1½ pts.		

		2% Parathion dust Parathion spray	18-20 ¼ to 1 lb.	25-30	
	Beet Leafhoppers	2% Parathion dust	20-25	20-25	
	Squash Capsid	1% Rotenone dust	15-18	20-25	When they appear in injurious numbers start control.
Sweet Corn	Flea Beetles	10% DDT dust 2.5% Heptachlor	12-15 20-30	20-25	Start controls when the beetles injury starts to appear on the small plants.
	Corn Earworm	5% or 10% DDT dust when plants in pre-tassel 5% DDT dust to silks	15-20	20-30	When worms start to appear in pre-tassel sometimes controls with airplane may be necessary. Start applications with 5% DDT with a stencil brush when the silks first appear. Daub dust on each ear, then 3 days later make another application, and another 3 days after that. Sometimes a fourth and fifth application may be necessary.
	Seed Corn Maggot	Seed treatment with 5% chlordane sometimes is satisfactory. 2.66 oz. of 75% Lindane to 100 lbs. of seed or 4 oz. of technical chlordane per 100 lbs. seed. Dieldrin 1 oz. technical per 100 lbs. of seed. 2 to 3 oz. Heptachlor per 100 lbs. of seed.			Endeavor to plant corn in well drained soil. Avoid planting too early.

Crop	Insect	Insecticide	Pounds per Acre Ground	Pounds per Acre Air	Remarks
Sweet Corn (cont'd)	Spider Mites	325-mesh conditioned dusting sulfur	18-20	25-30	Start controls when the spider mites start to fire the plants.
	Southwestern Cornstalk Borer				**Cultural measures** are the only controls at the present time. In the fall or when corn is harvested, cut stalks, then plow stubs out with middle-buster and let them weather. The larvae spend the winter in the root tips and will die when exposed to the hot or cold air.
	Fall Armyworm	15% Toxaphene, 5% DDT mixture	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.
	Lesser Cornstalk Borer	10% Chlordane dust 2% Aldrin dust	10-12 10-12	No No	Apply 10 to 12 lbs. of dust with ground rig just after planting seed. A second application may be necessary when plants are 4 to 5 inches high. This insect usually does not attack early plantings. Those after June 1, injured heavier.

White Potatoes	Leafhoppers	5% DDT and sulfur dust mixture 2% Dieldrin dust Dusting sulfur 2½% Heptachlor dust	15-18 15 18-20 20	20-30 20-25 25-35 20-25	Start control measures when insects appear to be injuring the crop, usually young or nymphs as well as adults are found on the plants.
	Flea Beetles	5% or 10% DDT and sulfur dust mixture 1% Rotenone dust	12-15 15-18	18-20 20-30	When flea beetles start causing holes to appear in the leaves, controls should be started.
	Psyllids	5% DDT and dusting sulfur mixture 50% Wettable DDT Lime sulfur, dry or liquid Wettable sulfur	15-18 3 to 4 lbs. in 50 gals. of water either way Follow directions 8-10 lbs. in 50 gals. water	20-30	Start controls when adults are first seen or when seven nymphs or young are found on the bottom leaves or leaflets.
	Aphids	5% Malathion dust 57% Malathion emulsion concentrate Nicotine sprays 40% Nicotine	10-15 1 to 1½ pts. per acre in 6-20 gals. of water 1 to 2 pts. in 25 to 50 gals. of water	25-30	Start applications when aphids appear to be stunting growth or when a great amount of honey dew is present. In most cases aphids do not injure potatoes.
	Blister Beetle	50% Cryolite dust 1% Rotenone dust 5% Chlordane	15-18 15-18 15-20	20-25 20-25 25-30	When the insects appear in injurious numbers, start controls.
	Potato Stalk Borer				Do not plant potatoes late in spring in poor soil.

Crop	Insect	Insecticide	Pounds per Acre		Remarks
			Ground	Air	
White Potatoes (cont'd)	Potato Tuber Moth				Be certain to plant seed free of tuber moths. Don't plant in soil where tuber moths were found in 3 previous years.
Sweet Potatoes	Salt Marsh Caterpillar				It is best to put a barrier of aluminum foil around the fields to prevent the migration into sweet potato fields.
Peas	Aphids or Plant Lice	10% DDT dust mixture 5% Malathion dust DDT sprays	12-15 12-15 1 to 2 lb. technical DDT	20-30 20-30	Start controls when a few infestations appear in the field. Sometimes the aphids are controlled by parasites and predators.
	Flea Beetles	10% DDT dust	15	20-25	When holes and beetles start appearing, start controls.
	Spider Mites	2% Parathion dust	12-15	25-30	When leaves start losing color and mites are numerous you should start controls.
Peppers	Cutworms	5% or 10% DDT dust mixture 20% Toxaphene dust 2½% Heptachlor	12-15 12-15 12-15	25-30 25-30 20-25	If cutworms appear, dust at once for their control.
	Hornworms	50% Cryolite dust 10% DDT dust	12-15 12-15	20-25 20-25	

Onions (dry and green)	Thrips	Dieldrin sprays 2% Dieldrin dust 2% Heptachlor dust 10% DDT dust 20% Toxaphene dust Heptachlor spray	.25 to .50 15-18 20-30 12-15 20-25 12-15 20-25 12-15 20-25 ½ lb. technical ¾ lb. technical	When injury is noticeable start controls and continue until results are secured. Most damage is done to late-planted onions or onions harvested during July and August.
	Maggots			Endeavor to plant in well-drained soil.
Tomatoes	Hornworms	5% or 10% DDT and sulfur dust DDT sprays 50% Cryolite dust 20% Toxaphene dust	15-18 20-30 1 to 1½ 1 to 1½ 15-18 20-30 15-18 20-30	Start controls when worms appear in injurious numbers. Do not apply any materials 30 days prior to harvest.
	Russet Mites	325-mesh conditioned sulfur dust	15-18 20-25	It is wise to use this sulfur dust on all tomatoes just before they start to bloom. This insect causes plants to turn a bronze color and die.
	Spider Mites or Red Spiders	325-mesh conditioned sulfur dust 5% Malathion dust	12-15 20-25 12-15 20-25	When mites cause injury.
	Tomato Fruit Worm	10% DDT dust 1% Rotenone	12-15 20-25 12-18 20-25	Start controls when either eggs or small worms appear on the plants.
	Flea Beetles	10% DDT dust	12-15 15-20	Start controls when the injury appears harmful to plants. DDT might injure very small plants.

Crop	Insect	Insecticide	Pounds per Acre Ground	Air	Remarks
Tomatoes (cont'd)	Psyllids	5% DDT and dusting sulfur mixture 50% Wettable DDT 50% Wettable Sulfur Any lime sulfur dust	15-18 3 to 4 lbs. in 50 gals. of water. Use according to directions.	20-30	Start controls when adults are first seen or when nymphs or young are found covering lower leaves of the plants.
	Blister Beetles	50% Cryolite dust 1% Rotenone dust	15-18 15-18	20-25 20-25	Start controls when they appear in injurious numbers.
	Beet Leafhoppers (Western Yellow tomato blight or curly top)				**No control** for the insects. Fewer diseased plants when seed planted in field and then thinned. In transplanting put three plants where one would be and destroy infected plants.
	Aphids				Generally speaking, aphids do very little damage to tomatoes. Best controls with 5% Malathion dust.
	False Chinch Bug				There is no insecticidal control. Attempt to drive bugs into a pile of straw and burn.
Okra	Cutworm	20% Toxaphene 10% DDT 2½% Heptachlor	15-18 15-18 15-18	20-25 20-25 20-25	Start controls when the injury appears.
	Bollworms	10% DDT and sulfur	15-18	20-25	When the worms start injuring the pods you may start controls.

Types of Formulations

Dusts

Most 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 to only a few plants to see if it controls the pest and does not injure the plant. The grower should satisfy himself 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. The grower should 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 give the antidote.

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 powders, 2½% and 5% dusts, 5 and 10% granules, emulsifiable concentrate containing two pounds active ingredient per gallon (about 23%).

BHC (Benzene-hexachloride)

Uses: Primarily for cotton insects; also mosquito control work. Used in sprays for lawns and turf, for thrip control on certain subtropical fruits including avocado and mango. Odor and off-flavor limits use on vegetables and most fruit trees after fruit set. Used extensively for control of livestock pests including lice, ticks, hornflies, fleas, mange mites, etc. Also used for control of borers in trees. Kills by contact, stomach poison and vapor action.

Formulations: Wettable powders containing 6, 8, 10 and 12% Gamma Isomer; emulsifiable concentrates; dust base and dusts.

Chlordane

Uses: Grasshoppers, soil insects including ants, white grubs, cutworms, wireworms, sowbugs, pillbugs, etc.; used for plant bugs; used in snail baits; used 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.

Chlorobenzilate

Uses: Red spiders (mites). A new material effective against resistant spider mites. Not widely used at present.

Formulations: 25% wettable powder; aerosols.

DDD (TDE)

Uses: Similar to DDT except not as wide and not as effective against certain insects. Widely used for hornworms and fruitworms on tomatoes, hornworms 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, livestock, ornamentals, white fringed beetles, lawn and turf insects 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 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 thrip control on ornamental plants like mums, gladiolus, thrips on subtropical fruits; soil inhabiting insects like ants, cutworms. Used in mosquito control work and for household pests; 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 2.5% dusts; 2% and 5% granules.

Diazinon

Uses: Phosphate insecticide used for resistant houseflies. Shows promise against some pests on agricultural crops.

Formulations: 25% wettable powder; 25% emulsifiable concentrate (contains 2 lbs. per gallon).

Endrin

Uses: Endrin is a stereoisomer 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.

EPN (EPN-300)

Uses: Phosphate insecticide with uses similar to parathion. Effective against pecan nut case bearer; serpentine leaf miner on tomatoes and potatoes. Shows promise for mites and scales. Effective on peach insects. Should be handled with great care. Not extensively used at present.

Formulations: 27% wettable powder.

Heptachlor

Uses: Chlorinated insecticide related to chlordane. Cotton insects; soil insects including wireworms; grasshoppers; mosquitoes, thrips on onions.

Formulations: 25% wettable powder; 2½% dust; 2½% and 25% granules; 25% emulsifiable concentrate (contains 2 lbs. actual per gallon).

Lead Arsenate (Standard)

Uses: Chewing insects on wide variety of crops. Kills as stomach poison. Largely replaced by new-

er 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; 50% 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% dust; 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 horn-flies, 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: Primarily for roost paint for poultry; aphids and other soft bodied insects. Except for small growers it has been largely replaced by newer materials.

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

Ovex

Ovotran, Orthotran, Niagaratran are some trade names.

Uses: Primarily to control mite eggs and newly hatched mites, but of little value as 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 cineraefolium*. 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 knock-down. Used to some extent in ornamental and vegetable garden dusts and sprays. Also an ingredient in many flea and lice powders. Pyrethrum is of very low toxicity to humans.

Formulations: Dusts, aerosols, sprays.

Rotenone

Rotenone is a botanical insecticide derived from the roots of derris, cube and timbo. Has low order of toxicity to humans.

Uses: For many garden and flower pests, but has been largely replaced on commercial crops by newer organic insecticides. Used widely for cattle grubs and Mexican bean beetles and in backyard vegetable gardens.

Formulations: 4% and 5% wettable powders; .75% to 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.

Tartar Emetic

Tartar emetic was formerly used in combination with brown sugar for control of thrips. It has been largely replaced by newer materials. Poison if swallowed.

TDE (See DDD)

Tepp

Tepp is a phosphate insecticide and miticide of very high toxicity to humans. It breaks down very rapidly when mixed with water and has residual of only a few hours.

Uses: Control of aphids, mites, leaf miners, thrips, and houseflies. Used on ornamentals and vegetables. Finished sprays should be used immediately after mixing. Dusts should be purchased freshly mixed.

Formulations: 20% and 40% emulsifiable concentrates; 1% dust; aerosols.

Toxaphene

Toxaphene is a chlorinated camphene.

Uses: Widely used on cotton insects, grasshoppers, armyworms, sod webworms, cutworms, stinkbugs. 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.

Quantity of Commercial Formulation Needed to Provide Exact Amounts of Technical Insecticides Per Acre

Insecticide Formulation. (% by weight of actual chemical)	1/8 pound technical	1/2 pound technical	3/4 pound technical	1 pound technical	1 1/2 pounds technical	2 pounds technical	3 pounds technical	5 pounds technical
15-20% Emulsifiable concentrate (11/2 lbs. per gal.)	1/3 quart 10 2/3 fl. ounces	1 1/3 quarts	2 quarts	2 2/3 quarts	1 gallon	5 1/3 quarts	2 gallons	3 2/5 gallons
23-25% Emulsion concentrate. 2 lbs. per gallon	1/2 pint (1 cup)	1 quart	1 1/2 quarts	2 quarts	3 quarts	1 gallon	1 1/2 gallons	2 1/2 gallons
42-50%. 4 pounds per gallon	1/4 pint (4 fl. oz.)	1 pint	1 1/2 pints	1 quart	1 1/2 quarts	2 quarts	3 quarts	5 quarts
60-65%. 6 pounds per gallon	1/6 pint 2 2/3 oz.	2/3 pint	1 pint	1 1/2 pints	2 pints	2 2/3 pints	2 quarts	3 1/3 quarts
72-80%. 8 pounds per gallon	1/8 pint 2 fl. oz.	1/2 pint	3/4 pint	1 pint	1 1/2 pints	1 quart	1 1/2 quarts	2 1/2 quarts
15% Wettable powder	13 1/2 ounces	3 1/2 pounds	5 pounds	6 2/3 pounds	10 pounds	13 1/2 pounds	20 pounds	33 1/3 pounds
25% Wettable powder	1/2 pound	2 pounds	3 pounds	4 pounds	6 pounds	8 pounds	12 pounds	20 pounds
40% Wettable powder	5 ounces	1 1/4 pounds	1 7/8 pounds	2 1/2 pounds	3 3/4 pounds	5 pounds	7 1/2 pounds	12 1/2 pounds
50% Wettable powder	1/4 pound 4 ounces	1 pound	1 1/2 pounds	2 pounds	3 pounds	4 pounds	6 pounds	10 pounds

*This is a publication of the Agricultural Extension Service, University of Arizona. See your local County Agricultural Agent or Home Demonstration Agent for other farm and home information.

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Chas. U. Pickrell, Director
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