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Insect Controls for Michigan Commercial Greenhouse and Bedding Plant Production
Michigan State University Extension Service

M. Keith Kennedy, Entomology

Issued April 1980

1 pages

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Insect Controls for Michigan Commercial Greenhouse & Bedding Plant Production

Prepared by: M. Keith Kennedy, Dept. of Entomology

COOPERATIVE EXTENSION SERVICE • MICHIGAN STATE UNIVERSITY • EXTENSION BULLETIN E-1276, April 1980

PESTS	Flowers								Vegetables			REGISTERED GREENHOUSE USES	AMOUNT TO APPLY	FREQUENCY OF APPLICATION	REMARKS	
	APHIDS	CATERPILLARS & CUTWORMS	CYCLENEM MITE	FUNGUS GNATS	MEALYBUGS	SCALES	SLUGS	SPIDER MITES	THRIPS	WHITEFLIES						
AEROSOLS AND VAPORS																
Dibrom (naled)	•				•				•		Tomatoes, Cucumbers	8 lb/G EC	Vaporize 1 oz/10,000 cu ft	2-3 treatments at 4-7 day intervals	Foliage must be dry. Close vents for at least 2 hr or overnight. Concentrate is highly corrosive to metals.	
Dithio* (Sulfotepp)	•				•	•			•		None	5% Aerosol	One 4 lb bomb/200,000 cu ft	Apply a 2-4 second spray for each 1,000 cu ft	Foliage must be dry. Close vents for at least 2 hr or overnight. Apply a 2-4 second application for each 1,000 cu ft. Also known as dithion and sulfotepp.	
Malathion	•				•				•	•	None	15% Aerosol	1 lb bomb/50,000 cu ft	2-3 treatments at 4-7 day intervals as needed	Foliage must be dry. Close vents for at least 2 hr or overnight. See remarks for Malathion under Foliar sprays.	
Nicotine*	•								•		Cucumbers, Radishes, Tomatoes	40% EC	Vaporize 1 oz/4,000 cu ft	2-3 treatments at 4-7 day intervals as needed	Foliage should be dry. Close vents for at least 2 hr or overnight. May injure blossoms.	
Resmethrin (SBP-1382)					•				•		None	1% Aerosol	A 5-second spray/100 sq ft of bench	2-4 treatments at 7 day intervals	Available as a 2½ lb or 15 lb cylinder. The 15 lb cylinder treats 100,000 sq ft of bench. For heavily infested areas, spray a serpentine path at 10 seconds/100 sq ft of bench. Do not treat red calceolaria or open blooms of shoemake mums. Keep greenhouse closed for 2-4 hr or overnight. Temperature should be 70-80° F.	
Vapona (dichlorvos)	•				•				•	•	See Label	EC	Vaporize 1 oz/10,000 cu ft	2-3 treatments at 4-7 day intervals as needed	Foliage must be dry. Close vents for at least 2 hr or overnight. Plant injury may result when greenhouse temperatures are high. Most effective at 60-65° F. Injury has occurred on some mum varieties, especially Shasta & Pink Champagne. Some snapdragons injured.	
Vapona (dichlorvos)	•				•				•	•	None	10% Aerosol	2-4 seconds for each 1,000 cu ft	2-3 treatments at 4-7 day intervals	Foliage must be dry. Close vents for at least 2 hr or overnight. Apply a 2-4 second application to each 1,000 cu ft. Also controls leaf miners and cabbage loopers. See remarks above.	
FOGS																
Diazinon	•		•						•	•	None	EC	1 oz/3,000 cu ft	Repeat in 4-7 days as needed	For carnations, mums & roses. Foliage should be dry. Close vents for 1½ hr. Maintain temperature between 70-85° F. Ventilate for 1 hr before re-entry.	
Dibrom (naled)	•				•				•	•	Tomato	EC	1 oz/3,000 cu ft	Repeat in 4-7 days as needed	For carnations, mums (except Shasta), poinsettias, roses (except white butterfly), snapdragons & for whitefly on tomato. For mites & mealybugs on all ornamentals. Plant foliage must be dry. Close vents for 1½ hr. Ventilate for 2 hr before re-entry. Temperature should be 75-80° F for application to tomatoes. Do not apply to tomatoes within 15 days of harvest.	
Dithio (Sulfotepp)	•				•				•	•	None	EC	1 oz/3,000 cu ft	Repeat in 4-7 days as needed	For carnations, mums, azaleas, poinsettias & snapdragons. Foliage should be dry. Close vents for 1½ hr. Maintain temperatures between 70-85° F. Ventilate for 1 hr before re-entry.	
Kelthane (dicofol)									•		None	EC	1 oz/3,000 cu ft	Repeat in 4-7 days as needed	For carnations, mums & roses. Foliage should be dry. Close vents for at least 1½ hr. Maintain temperature between 70-80° F. Ventilate for 1 hr before re-entry.	
Lindane	•				•				•	•	None	EC	1 oz/3,000 cu ft	Repeat in 4-7 days as needed	For carnations, mums, geraniums, roses & snapdragons. Foliage should be dry. Close vents for 1½ hr. Ventilate 1 hr before re-entry. Temperature should be between 70-85° F.	
Malathion	•				•				•	•	None	EC	1 oz/3,000 cu ft	Repeat in 3 days as needed	Foliage should be dry. Close vents for at least 1½ hr. Maintain temperature at 70-85° F. Ventilate 1 hr before re-entry. For roses, carnations, snapdragons, mums & geraniums.	
Pentac									•		None	EC	1 oz/3,000 cu ft	Two applications at 12-day intervals	Foliage should be dry. Close vents for at least 1½ hr. Maintain temperatures at 70-80° F. Ventilate 1 hr before re-entry. May require 3-5 days to show effects. For roses, carnations & mums.	
Resmethrin (SBP-1382)									•		None	EC	1 oz/3,000 cu ft	Repeat in 4-7 days as needed	Foliage should be dry. Close vents for at least 1½ hr. Maintain temperature around 70° F. Apply before bloom formation.	
Vapona (dichlorvos)	•				•				•	•	Tomato (See Label)	EC	1 oz/3,000 cu ft	Repeat in 4-7 days as needed	For carnations, mums, roses & on tomatoes for whitefly only. Plant foliage and blooms should be dry. Close vents for 1½ hr. Ventilate for 2 hr before re-entry. On tomatoes, make sure temperature is in the 70-80° F range. Do not treat tomatoes within 24 hr of harvest.	
FOLIAR SPRAYS																
Bacillus thuringiensis		•									Cabbage, Cucumbers, Lettuce, Tomatoes	WP	100 G 1 G ½-1 lb 1-2 tsp	Apply when pests are first noticed & repeat as needed	Thorough coverage is necessary for good control. After ingestion, larvae stop feeding & death follows in 2-3 days. Nontoxic. Also known as Dipel, Bactur and Biotrol.	
Dylox (trichlorfon)		•									See Label	4 lb/G EC	2-3 pt 2-3 tsp	Repeat as needed	Injury has occurred on some carnations, hydrangeas & zinnias. If in doubt, treat only a few plants & observe for 4-5 days.	
Kelthane (dicofol)			•						•		None	35% WP	1½ lb 1½ Tbl	2-3 applications at 4-7 day intervals	Use higher rates for cyclamen mite. May be combined with other insecticides. Works best at cool temperatures (68° F).	
Lindane	•	•							•	•	See Label	1.65 lb/G EC	1 pt 1 tsp	1-2 applications at 4-7 day intervals	Injures some poinsettias & hydrangeas.	
Malathion	•	•			•				•	•	Cucumbers, Endive, Lettuce, Radishes, Tomatoes, Watercress	57% EL	1½-2 pt 2 tsp	1-2 applications at 4-7 day interval or as needed	Do not use on ferns, petunias, crassulas, orchids, curcubits, saint-paulia, gloxinia, rieger begonias & some carnation varieties. Read the label.	
Methoxychlor		•							•		See Label	50% WP	2-3 lb 2 Tbl	Repeat in 7-14 days as needed	Outdoor use only. Treat soil surface as well.	
Meta-systox-R (oxydemetonmethyl)	•								•	•	See Label	2 lb/G SC	1-1½ pt 1½ tsp	Repeat in 4-7 days as needed	Do not handle treated plants until spray deposit has dried. Injury has occurred on some mums & Easter lilies.	
Nicotine*	•								•		Cucumbers, Radishes, Tomatoes	40% EC	1-2 pt 1-2 tsp	2-3 treatments at 4-7 day intervals as needed	Do not apply to leafy vegetables within 7 days of harvest or other vegetables within 3 days of harvest. May injure blossoms.	
Omite (propargite)									•		None	30% W	1-1½ lb 1-1½ Tbl	2-3 times at 4-7 day intervals as needed	Registered for greenhouse roses & outdoors for mums & carnations. Thoroughly wet both leaf sides. Injury has occurred on some foliage plants & bloom of carnations, some mums, & poinsettia bracts.	
Orthene (acephate)	•	•							•		None	75% SP	¾ lb ¾ Tbl	Repeat in 7-10 days as needed	Greenhouse uses on roses, carnations & mums only. Outdoor use on daisies, gladiolus, statice, yarrow & strawflower. Injury has occurred in some mums; see label for varieties.	
Pentac									•		None	50% WP	½ pt 1 tsp	2 applications at 2-week intervals	Thorough coverage of both leaf sides is necessary. Works best at 68-75° F temperatures. Foliar injury has occurred on some mums. Do not apply to open blooms.	
Pirimor (pirimicarb)	•										None	50% WP	4-8 oz ¼-½ tsp	As soon as pest is noticed & at 7-day intervals not more than 4 times	Has contact & fumigant activity. Will not harm blossoms. For mums only.	
Plectran (cyhexatin)									•		None	50% WP	4-6 oz	2-3 applications at 7-14 day intervals	For use on greenhouse-grown carnations, mums, poinsettias & roses. No wetting agent is needed. Thorough coverage is essential. Occasional injury to mum blossoms & poinsettia bracts has occurred.	
Resmethrin (SBP-1382)									•		None	2 lb/G EC	1 pt 1 tsp	Repeat weekly for 4 weeks for control of all stages	Spray upper & lower leaf surfaces to runoff. Best results at 70° F. Apply before poinsettia blooms. When fewer applications are preferred, spray at the rate of 1 qt/100 gal.	
Systox* (demeton)	•				•	•			•	•	See Label	2 lb/G EC	1-1½ pt 2 tsp	Repeat in 4-7 days as needed	Plants should be thoroughly wetted. Injury has occurred on African violets, some ferns & croft lilies.	
Thiodan (endosulfan)	•	•							•	•	Tomatoes	2 lb/G EC	1 qt 1 Tbl	Repeat in 4-7 days as needed	Injury to some mums and geraniums has occurred. Use proper mask or respirator.	
Thiodan (endosulfan)	•	•							•	•	Tomatoes	50% WP	1 lb 1 Tbl	Repeat in 4-7 days as needed	Same as above.	
Tedion (tetradifon)									•		Cucumbers	1 lb/G M	1 qt 1 tsp	Repeat in 4-7 days as needed	Thorough coverage of both leaf sides is important. Works best at temperatures above 80° F. Injury has occurred on white butterfly cinderella roses (leaf drop). Do not apply to mums.	
Vendex (hexakis)									•		None	50% WP	8-16 oz ½-1 tsp	Repeat at 4 week intervals	Apply to foliage only of chrysanthemums (pre-bract) and poinsettia (pre-bract). Do not add oil to spray solution. Use goggles and a face mask during application. See label for precautions.	
GRANULES																
Measurrol (methiocarb)						•					None	2% G	1 lb/1,000 sq ft	As needed	Apply bait to soil around plants or flats but not on plant foliage.	
Temik* (aldicarb)	•				•				•	•	None	10% G	18-28 oz/1,000 sq ft of bed or 28-37 oz /1,000 sq ft of bed	One application should give 50-day protection	Approved in Michigan for commercially grown ornamental flower crops, foliage plants & bulb crops. See label. Use higher rate for mealybugs & spider mites & scale crawlers. Use caution when handling this very toxic material. Do not apply to wet foliage. Do not market potted plants within 4 weeks after last application.	
SMOKES																
Dithio* 15% (sulfotepp)	•				•	•			•	•	None	SG	3½ oz can/10,000 cu ft	Repeat in 3-4 days as needed	Foliage should be dry. Close vents for at least 2 hr. Maintain temperature between 70-80° F or overnight. Has been used safely on poinsettias. Also known as Dithione, Plant fume 103, Sulfotepp.	
Lindane	•										Lettuce, Tomatoes, Cucumbers	SG	See Label	Repeat in 4-7 days as needed	Foliage should be dry. Close vents for at least 2 hr or overnight. Can be used on all flower crops. Also known as aphid smoke. Can injure seedlings.	
Nicotine* 14%	•								•		Lettuce, Tomatoes, Cucumbers	SG	12 oz can/20,000 cu ft	Repeat in 3-4 days as needed	Foliage should be dry. Close vents for 2-3 hr or overnight. Maintain temperatures between 70 and 80° F. May damage foliage of cineraria, impatiens & hydrangea. May damage blossoms of snapdragon & geranium.	
Parathion*	•								•	•	None	SG	See Label	Repeat in 3-4 days as needed	Foliage should be dry. Close vents for at least 2 hr or overnight. Handle this highly toxic material with caution.	
Tedion/Dithio* (15%/12.5%)	•				•	•			•	•	None	SG	6 oz can/10,000 cu ft	Repeat in 3-4 days as needed	Foliage should be dry. Close vents for at least 2 hr or overnight. May cause leaf drop in white butterfly roses. Maintain temperature above 65° F.	
Thiodan (endosulfan)	•								•	•	Lettuce, Tomatoes, Cucumbers	SG	See Label	Repeat in 3-4 days as needed	Foliage should be dry. Close vents for at least 2 hr or overnight. Safely used on many ornamentals.	
Vapona (dichlorvos)	•				•				•	•	Lettuce, Tomatoes, Cucumbers	SG	6 oz can/10,000 cu ft	Repeat in 3-4 days as needed	Foliage should be dry. Close vents for at least 2 hr or overnight. May burn certain mum varieties, ageratum, snapdragons & tradescantia. Will also control some leaf miners and leafrollers. Poinsettia bract may be injured.	
Tedion (tetradifon)									•		None	SG	6 oz can/10,000 cu ft	Repeat in 3-4 days & then at 10-day intervals as needed	Foliage should be dry. Close vents for 4 hr. Ventilate for 8 hr. Apply at night or during cloudy days. See also remarks for Tedion foliar sprays.	
SOIL DRENCH																
Meta-systox-R (oxydemetonmethyl)	•								•	•	See Label	2 lb/G SC	1½ pt 1½ tsp	Every 7-10 days as needed	On mums, dahlias & roses. Apply 4 oz of finished spray/6-8 inch pot.	
Systox* (demeton)	•				•	•			•	•	See Label	2 lb/G EC	1½ pt 2 tsp	Every 4-7 days or as needed	Apply 1 pt of finished sprays/sq ft of bed or bench. Apply 4 oz per 6 inch pot. Do not apply within 5 days of hand-picking, pruning, or other handling.	

***Restricted Use Pesticide**

Key to Formulation:

EC = Emulsifiable concentrate
EL = Emulsifiable liquid
G = Granular
M = Miscible
SC = Sprayable concentrate
SG = Smoke generator
SP = Sprayable powder
WP = Wettable powder

General Comments on Pesticide Application

- Wettable powder formulations should be agitated in the spray tank. It is good practice to agitate all pesticides during the mixing and spraying process.
- Most fungicides and insecticides, except some copper compounds (Bordeaux mixture) are most effective in an acid solution (pH 5.5-7.0). Water may be acidified by using phosphoric acid or muriatic acid or other acid materials which are compatible with your spray mix.
- Do not apply pesticides when temperatures are 80° F or higher or are expected to be in this range shortly after application.
- All pesticides should be stored in a cool (but never freezing), dry place under lock and key.
- Read the label!

WETTABLE POWDERS

Number of ounces of wettable powder to use in small sprayers when amount per 100 gallons is known.

100 GAL	10 GAL	5 GAL	2 GAL	1 GAL
0.5 lb	0.8	0.4	0.2	0.1
1 lb	1.6	0.8	0.3	0.2
2 lb	3.2	1.6	0.6	0.3
3 lb	4.8	2.4	1.0	0.5
4 lb	6.4	3.2	1.3	0.6
5 lb	8.0	4.0	1.6	0.8

EMULSIFIABLE CONCENTRATES

Number of fluid ounces of emulsifiable concentrate to use in small sprayers when amount per 100 gallons is known.

100 GAL	10 GAL	5 GAL	2 GAL	1 GAL
1 pt	1.6	0.8	0.3	0.2
1 qt	3.2	1.6	0.7	0.3
2 qt	6.4	3.2	1.3	0.6
1 gal	12.8	6.4	2.6	1.3

TABLE OF MEASURES

LIQUID

- 1 level tablespoon = 3 level teaspoons
- 1 fluid ounce = 2 tablespoons = 29.57 milliliters
- 1 cupful = 8 fluid ounces
- 1 pint = 2 cupfuls = 16 fluid ounces
- 1 quart = 2 pints = 32 ounces
- 1 gallon = 4 quarts = 128 fluid ounces

WEIGHT

- 1 pound = 16 ounces = 454 grams
- 1 ounce = 28.3 grams

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