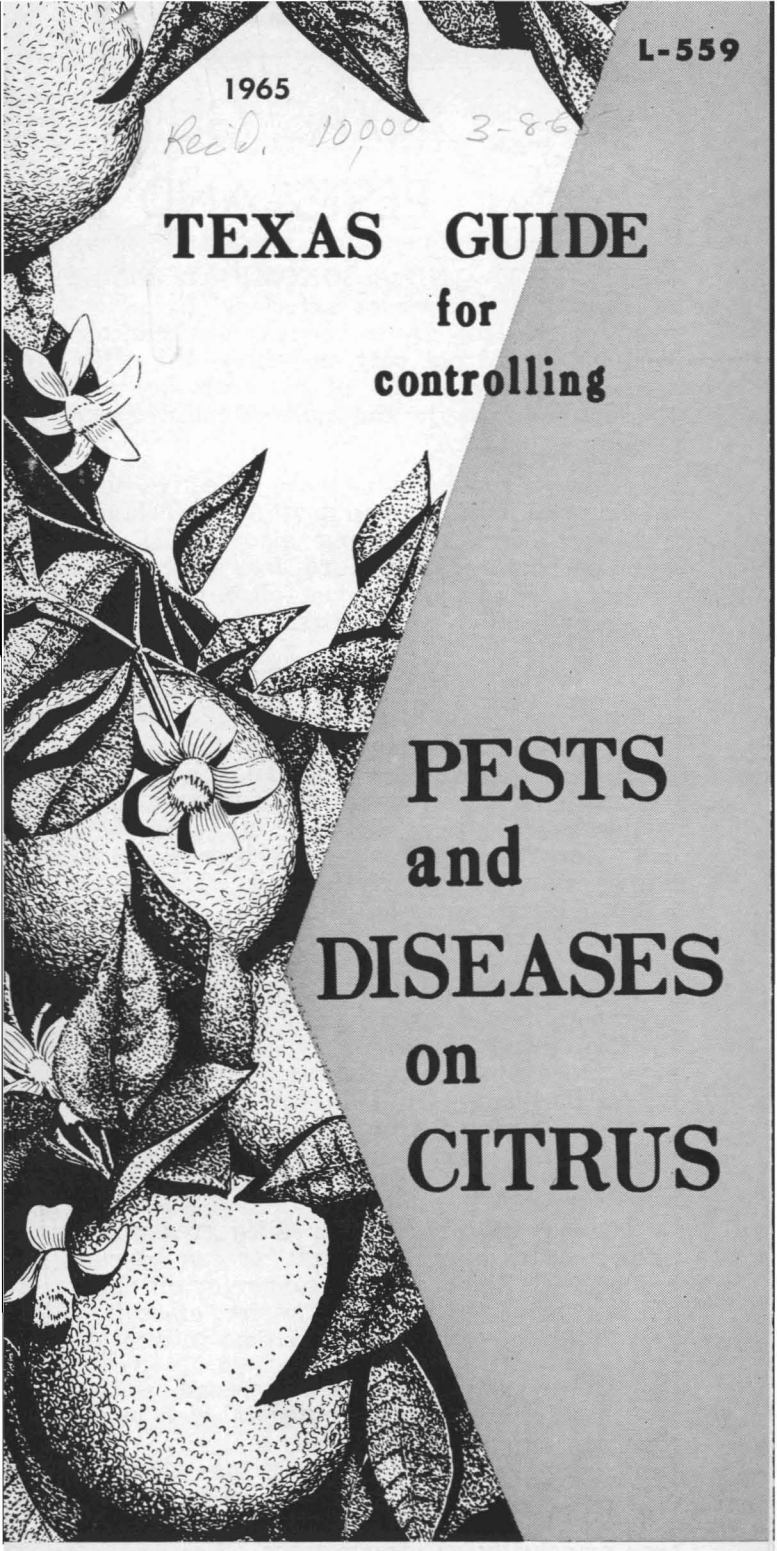

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TEXAS GUIDE for controlling PESTS and DISEASES on CITRUS

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TEXAS GUIDE FOR CONTROLLING PESTS AND DISEASES ON CITRUS

EFFECTIVE AND ECONOMICAL control of insects and diseases affecting citrus depends on the fruit grower's choice of chemicals. And his choice not only influences the effectiveness and economics of his crop, but also the maximum use he can make of natural controlling agents.

Spraying usually is more effective than dusting and is superior to dusting for melanose disease control. Spraying also is the only practical control procedure for scale insect control. Make applications following a post-bloom application on the basis of pests in the grove.

DISEASES

Melanose (sandpaper) disease occurs on all citrus varieties, although grapefruit is more susceptible than oranges. The fungus attacks young fruit, leaves and twigs but is economically important in Texas only because it reduces eye-appeal of fresh fruit. Mature or hardened tissues resist infection. This wet season disease needs several days of high humidity for the fungus to sporulate and infect young tender tissues. The disease is more prevalent in the more humid eastern half of the Lower Rio Grande Valley. Neutral copper effectively controls melanose. Apply sprays before the young fruit average ½ inch in diameter. A single high pressure spray treatment usually gives commercial control of melanose.

Greasy spot, sometimes called greasy melanose, occurs only on leaves. It can be controlled with Zineb, neutral copper or oil emulsion. Zineb is preferred, however, since it is also highly effective against citrus rust mites.

Mottle-leaf (zinc deficiency) can be controlled effectively by using neutral zinc in the first spray application of the crop year. Neutral zinc is more convenient to use than the old zinc sulfate-lime mixture and leaves less undesirable residue on leaves. Mottle-leaf occurs principally on orange trees. *See Table 2 and discussion of materials for rates to use.*

DUSTS

See discussion of pesticidal dusts for recommended amounts to use.

PROPER APPLICATION

Dust trees when the air is calm and the temperature is 75 to 90 degrees F. Spraying is costly, and thorough coverage is important. Apply spray at a pressure of 50 to 600 pounds per square inch in amounts sufficient to wet all tree parts, including both sides of the leaves, all fruit, twigs and branches.

Use 50 to 80 pounds of dust per acre on mature trees. It is best to blow the dust from two sides. The degree of control is determined by the completeness of coverage, type of application and conditions under which application is made.

MATERIALS

Pesticidal Sprays

Amounts given are based on 100 gallons of spray mixture.

1. NEUTRAL COPPER—¾ pound metallic copper. (Controls melanose and greasy spot.)
2. WETTABLE SULFUR—10 pounds plus ¾ pound metallic copper. (Controls citrus rust mites, melanose disease, greasy spot disease and partially controls "Texas citrus mites." See Table 2.)
3. WETTABLE SULFUR—10 pounds plus 1 pound of 75 percent Zineb wettable powder. (Controls citrus rust mites, greasy spot and partially controls Texas citrus mites.)
4. ZINEB—1 pound of 75 percent wettable powder. (Controls citrus rust mites and greasy spot disease.) Zineb may be used in combination with materials 1, 2, 5, 6, 7, 8, 9, 10, 11, 12 and 13.
5. TETRADIFON (Tedion) — 1 quart of 12.3 percent emulsifiable concentrate or 1 pound of 25 percent wettable powder. (Controls Texas citrus mites.) Apply only once per season while fruit is pres-

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SPRAY PROGRAM

See discussion of materials for application rates and compatability of chemicals.

Post-bloom Application (Apply before fruit is ½ inch in diameter)	Remarks
Zineb + Tetradifon (Tedion)	Controls citrus rust mites and Texas citrus mites.
or	
Zineb + Kelthane	Controls citrus rust mites, Texas citrus mites and false spider mites.
or	
Wettable sulfur + Zineb	Controls citrus rust mites.
or	
Zineb or Chlorobenzilate plus 1 percent oil	Controls scale insects, Texas citrus mites and citrus rust mites.

Add copper to the previously mentioned sprays if melanose is a problem.

Additional Applications; apply as needed when infestations warrant.

Summer	
Zineb or chlorobenzilate plus 1.6 percent oil	Controls citrus rust mites, Texas citrus mites and scale.
or	
Zineb plus 1.6 percent oil + carbaryl (Sevin)	Controls brown soft scale.
or	
Wettable sulfur + Zineb	Controls citrus rust mites.
Fall	
Zineb plus tetradifon (Tedion)	Controls citrus rust mites and Texas citrus mites. Do not use tetradifon if used in post-bloom application.
or	
Zineb + Kelthane	Controls citrus rust mites, Texas citrus mites and false spider mites.
Supplemental Application	
Carbaryl (Sevin) plus 1.6 percent oil + Zineb	Controls brown soft scale, other scale, Texas citrus mites and citrus rust mites. Do not apply oil within 6 weeks of harvest or later than September 15.
or	
Carbaryl (Sevin) + Zineb	Controls brown soft scale and late season rust mites.
or	
Chlorobenzilate	Controls citrus rust mites.
or	
Sulfur *Dust*	Controls citrus rust mites.

DUST PROGRAM

Post-bloom Application (Apply immediately after fruit set.)	Remarks
Sulfur	Controls citrus rust mites. Partially controls Texas citrus mites and false spider mites.
or	
Sulfur plus Kelthane	Controls citrus rust mites, Texas citrus mites and false spider mites.

If melanose is a problem, refer to spray program.

Additional Application (Apply as needed when infestations warrant.)	
Sulfur	Controls citrus rust mites only. (Partially controls Texas citrus mites and false spider mites).
or	
Sulfur plus Kelthane	Controls citrus rust mites, Texas citrus mites and false spider mites.

ent. Tedion may be used in combination with materials 1, 2, 3, 4, 7, 8, 9, 10, 11, 12 and 13.

6. KELTHANE—0.8 pint of 42 percent emulsifiable concentrate. (Controls Texas citrus mites and false spider mites.) Kelthane may be used in combination with materials 1, 2, 3 and 4.
7. PETROLEUM OILS — 1.6 percent of actual oils as the emulsive or emulsified material. (Controls scale insects, whiteflies, Texas citrus mites, false spider mites and greasy spot.) Oil sprays should be used in combination with Zineb (material 4) to control citrus rust mites. To control brown soft scale, add 0.6 pounds of 80 percent carbaryl (Sevin) wettable powder. Continued agitation prevents separation of Sevin and oil in the spray tank. Do not apply oils to drouth-stricken trees. Oil sprays applied during the fall may delay grapefruit maturity, interfere with the coloring of early harvested fruit and cause cold injury. *Do not apply oil and sulfur in combination or within 30 days of each other.*

Table 1. Gallons of oil spray concentrate per 100 gallons of spray mixture.

Percent oil shown on label	Gallons of actual oil needed to make 1 percent mixture	1.6 percent mixture
97-98	1	1 2/3
90-92	1 1/10	1 3/4
80-84	1 1/4	2

Oils used on citrus trees should have an unsulfonated residue of at least 92 percent to minimize harmful effects to the trees.

8. CARBARYL (Sevin)—1.25 pounds of 80 percent wettable powder (for brown soft scale). Carbaryl is also effective when used with petroleum oils and Zineb (0.6 pounds of 80 percent wettable powder). Carbaryl creates an environment favorable to spider mite and armored scale development.
9. CHLOROBENZILATE—1 pint of 50 percent emulsifiable concentrate controls false spider mites and citrus rust mites. It kills rust mites faster than Zineb, but has a shorter residual.

Nutritional Sprays

10. NEUTRAL ZINC—2 pounds of 50 percent neutral zinc concentrate. (Corrects and prevents little-leaf or mottle-leaf of

citrus.) Neutral zinc may be used in combination with materials 1, 2, 3, 4, 5, 6, 8, 9, 11, 12 and 13. See Table 2.

11. NEUTRAL MANGANESE—2 pounds of 50 percent manganese concentrate. (Corrects and prevents mottle-leaf due to manganese deficiency.) Neutral manganese may be used in combination with materials 1, 2, 3, 4, 5, 6, 8, 9, 10, 12 and 13. See Table 2.
12. NEUTRAL IRON—2 pounds of 30 percent neutral (partly chelated) iron concentrate. (Aids in correcting chlorosis due to iron deficiency.) Neutral iron may be used in combination with formulas 1, 2, 3, 4, 5, 6, 8, 9, 10, 11 and 13.
13. UREA — of low (under 0.3 percent) biuret content, 5 to 8 pounds. (Increases the nitrogen content of the leaves during the fruit setting period.) Urea may be used for post-bloom sprays in combination with materials 2, 3 and 4.

Table 2. Pounds of copper, zinc, manganese compounds to use per 100 gallons of water.

Percent Metallic content shown on label	34-36	48	52-56	75	80
			Pounds		
Copper	2.2	1.6	1.4	1.0	0.9
Zinc			1.8		1.2
Manganese		2.4	1.8		0.9

Certain spreader-stickers may be added to spray mixtures containing only wettable powders to prolong their effectiveness in case of rain soon after application.

Pesticidal Dusts

1. SULFUR—50 to 80 pounds per acre of 325-mesh. (Primarily to control citrus mites, but gives some control of spider mites.)
2. SULFUR-KELTHANE — 325-mesh sulfur, plus 3 percent Kelthane. (Controls citrus rust mites and spider mites.)

Table 3. Minimum days from application to harvest.

CARBARYL (SEVIN)	5
ZINEB	0
KELTHANE	7
TETRADIFON (TEDION) (only 1 application per year)	0
MALATHION	7
SULFUR	0
NEUTRAL COPPER, ZINC, MANGANESE AND IRON	0
PETROLEUM SPRAY OIL	0
CHLOROBENZILATE	0

BIOLOGICAL CONTROL

Natural populations of beneficial insects play an important role in the control of certain citrus pests in Texas. However, commercial, artificial introduction of predaceous or parasitic insects in the State have not proved significant in reducing harmful pest infestations.

Use of Phosphate Insecticides

Use organic phosphate insecticides to control scale insects only when oil spray use is unsafe. Phosphate insecticides kill beneficial insects which help control scale pests.

Ants

Ants that infest citrus trees may interfere with parasites and predators which feed on certain pests. Also, ants may spread insects which produce "honeydew" on which sooty mold develops. Control soil inhabiting ants with 5 percent heptachlor or 2½ percent dieldrin or 5 percent chlordane dust or granules. Tree-inhabiting species are controlled by "painting" or "spot" spraying the nests with heptachlor, dieldrin or chlordane emulsions, prepared according to the manufacturer's directions. Spray with a low-pressure, manually operated sprayer. Apply pesticides only to the nests. Proper treatment of tree wounds help control acrobatic (wood) ants that infest citrus trees.

This manuscript was prepared by entomologists, plant pathologists and horticulturists of Texas A&M University and Texas A&I College Citrus Center.

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