

**TEXAS GUIDE**  
for  
**controlling**

**PESTS**  
and  
**DISEASES**  
on  
**CITRUS**

TEXAS A&M UNIVERSITY  
TEXAS AGRICULTURAL EXTENSION SERVICE  
J. E. Hutchison, Director, College Station, Texas

# TEXAS GUIDE FOR CONTROLLING

JAMES A. DEER, Area  
JOHN G. THOMAS, Extension Entomologist

TEXAS A&M

**E**FFECTIVE AND ECONOMICAL CONTROL of citrus pests and diseases depends on the fruit grower's selection of chemicals, as well as timeliness of properly-applied applications. 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  $1\frac{1}{2}$  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.

## PROPER APPLICATION

Spraying is costly, and thorough coverage is important. Apply spray at a pressure of 400 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. Certain spreader-stickers may be added to spray mixtures containing only wettable powders to prolong their effectiveness in case of rain soon after application.

Dust trees when the air is calm and the temperature is 75 to 90 degrees F. 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 deter-

# PESTS AND DISEASES ON CITRUS

Extension Entomologist

E. JOSE AMADOR, Area Extension Plant Pathologist

UNIVERSITY

mined 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. AZINPHOSMETHYL (Guthion) — 1.5 pints of 25 percent emulsifiable concentrate. Do not apply more than twice per fruit year. A single application per year may be applied up to within 7 days of picking. Where two applications are required, the second spray should not be applied within 28 days of harvest. Do not pick fruit or do other work involving tree contact, such as pruning, within 7 days of treatment. Controls Texas citrus mites, citrus rust mites and brown soft scale.
2. CARBARYL (Sevin) — 1 pound of 80 percent wettable powder (for brown soft scale). Carbaryl (0.4 pound of 80 percent wettable powder) is also effective when used with petroleum oils and zineb. Carbaryl creates an environment favorable for spider mite and armored scale development when used with petroleum oils and zineb for brown soft scale control.
3. CHLOROBENZILATE —  $\frac{3}{4}$  to 1 pint of 50 percent emulsifiable concentrate controls false spider mites and citrus rust mites. Kills citrus rust mites faster than zineb, but has a shorter residual.
4. DEMETON (Systox) —  $\frac{1}{2}$  pint of 2 pounds per gallon spray concentrate for aphid control. Use as required for aphid control but allow 21 days between last application and harvest.
5. DICOFOL (Kelthane) — 0.8 pint of 42 percent emulsifiable concentrate. Controls Texas citrus mites and false spider mites.
6. DIOXATHION (Delnav) — 1 pint of 33 percent emulsifiable concentrate. Do not repeat application within 90 days if fruit is present at time of first application. Controls Texas citrus mites and citrus rust mites. Fall application is preferred.
7. ETHION — 1 pint of 47.7 percent emulsifiable concentrate. No time limitation on oranges or grape-

fruit, but do not repeat application within 90 days. For lemons and limes, do not apply more than once per season and allow 21 days between last application and harvest. Controls Texas citrus mites and citrus rust mites.

8. MALATHION — 1½ to 2 pints of 57 percent emulsifiable concentrate. Do not apply during full bloom. Allow 7 days between last application and harvest. Controls citrus aphids.
9. NEUTRAL COPPER — ¾ pound metallic copper. Controls melanose and greasy spot. Used in combination with wettable sulfur. (See item 12.) Combination of neutral copper and petroleum oils may result in some fruit or foliage spotting. Neutral copper in combination with zineb may reduce the effectiveness of zineb.
10. PETROLEUM OILS — 1.6 percent of actual oils as the emulsive or emulsified material (See Table 1). Controls scale insects, white-flies, Texas citrus mites, false spider mites and greasy spot. Oil sprays should be used in combination with zineb to control citrus rust mites. To control large populations of brown soft scale, add 0.4 pound of 80 percent carbaryl (Sevin) wettable powder. For properly mixing oils in spray tank, add petroleum oils when water level reaches agitator shaft. Add other chemicals when tank is two-thirds to three-fourths full. Continued agitation until tank is empty is necessary to prevent separation of petroleum oils and other chemicals. 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 increase 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.

11. PHOSPHAMIDON — ½ pint of 8 pounds per gallon emulsifiable concentrate. Do not apply within four months of harvest. Controls citrus aphids.

12. WETTABLE SULFUR — 10 pounds plus  $\frac{3}{4}$  pound metallic copper controls citrus rust mites, melanose disease, greasy spot disease and partially controls Texas citrus mites. 10 pounds plus 1 pound of 75 percent zineb wettable powder controls citrus rust mites, greasy spot and partially controls Texas citrus mites.
13. TETRADIFON (Tedion) — 1 quart of 12.3 percent emulsifiable concentrate or 1 pound of 25 percent wettable powder controls Texas citrus mites where resistance has not been encountered. Apply only once per season while fruit is present.
14. ZINEB — 1 pound of 75 percent wettable powder. Controls citrus rust mites and greasy spot disease. The addition of wettable sulfur in situations of heavy populations aids in improving initial knockdown. (See item 12.) Where fly-speck fungus has been a problem, 2 pounds are recommended.

### **Pesticidal Dusts**

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

### **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 has not proved significant in reducing harmful pest infestations.

### **APHIDS**

Aphids may occasionally cause damage prior to and during the bloom period to the extent that control is required on oranges, tangerines or tangelos. Only affected trees should be treated. Buildups will commonly be noted on new foliage. Malathion, demeton, azinphosmethyl (Guthion) and phosphamidon may be effectively used according to manufacturer's directions. More than one application may be required.

### **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 helps control acrobatic (wood) ants that infest citrus trees.

### **WARNINGS ON THE USE OF CHEMICALS**

Most insecticides and fungicides are poisonous and should be used with caution. Pesticides should be stored out of reach of children, irresponsible persons and livestock. Empty pesticide containers and “left-over” spray materials should be promptly and properly disposed of. Some materials, especially the organophosphorous-type compounds, are extremely toxic and protective clothing and equipment should be worn when these are used.

All precautions and safety rules on the label should be closely followed. Avoid pesticide drift to adjoining crops. Observe closely the minimum waiting period between application and harvest to avoid prohibited pesticidal residue levels in the harvested fruit and poisoning problems with the picking crews.

Organic phosphate compounds or carbaryl (Sevin) are suggested for use only where heavy populations preclude the use of other recommended materials. Phosphate compounds and carbaryl kill beneficial insects which aid in the population suppression of scale insect pests.

### **HAZARDS TO BENEFICIAL INSECTS AND HONEY BEES**

Indiscriminate use of insecticides or acaricides is wasteful and may lead to serious outbreaks of other insects if the natural enemy balance is seriously disturbed. Do not apply chemicals unless they are needed.

Pollination by honey bees and native bees is required in citrus groves for maximum production. Every effort should be made to select materials, time applications and use recommended rates in order to avoid a reduction in pollinator populations.

### **ADDITIONAL INFORMATION**

Specific guidance pertinent to the selection, method of application and timing of the treatment that will most adequately meet individual grove requirements can be obtained by consulting your local county Extension agent.

## SPRAY PROGRAM

See discussion of materials for application rates, pages 3 to 5.

### Post-bloom Application

(Apply before fruit is 1/2 inch in diameter)

Chemical	Minimum days from last application to harvest*	Target Pests (See discussion of materials for application precautions)
Zineb + tetradifon (Tedion) or	0	Citrus rust mites and Texas citrus mites.
Zineb + dicofol (Kelthane) or	7	Citrus rust mites, Texas citrus mites and false spider mites.
Zineb + wettable sulfur or	0	Citrus rust mites, false spider mites and partially controls Texas citrus mites.
Zineb or chlorobenzilate + 1 % oil	0	Citrus rust mites, false spider mites, Texas citrus mites and scale insects.

Add copper to the previously mentioned sprays if melanose is a problem, except where oil is used.

### Additional Applications

(Apply as needed when infestations warrant)

#### Summer

Zineb or ethion or chlorobenzilate + 1.6 % oil or	0*	Citrus rust mites, Texas citrus mites, false spider mites and armored scales.
Zineb + 1.6 % oil + carbaryl (Sevin) or	5	Citrus rust mites, Texas citrus mites, false spider mites and scale insects (including brown soft scale).
Zineb + wettable sulfur or	0	Citrus rust mites, false spider mites and partially controls Texas citrus mites.
Azinphosmethyl (Guthion)	7	Texas citrus mites, citrus rust mites and brown soft scale.

#### Fall

Zineb + tetradifon (Tedion) or	0*	Citrus rust mites and Texas citrus mites. Do not use tetradifon if used in post-bloom application. Apply only once per season while fruit is present.
Zineb + dicofol (Kelthane) or	7	Citrus rust mites, Texas citrus mites and false spider mites.
Azinphosmethyl (Guthion) or dioxathion (Delnav) or ethion	*	Texas citrus mites and citrus rust mites. Brown soft scale control with azinphosmethyl only.

### Supplemental Application

Carbaryl (Sevin) + 1.6 % oil + zineb or	5	Brown soft scale, other scale, Texas citrus mites and citrus rust mites.
Carbaryl (Sevin) + zineb or	5	Brown soft scale and late season rust mites.
Chlorobenzilate or	0	Citrus rust mites and false spider mites.
Sulfur dust	0	Citrus rust mites.

## DUST PROGRAM

See discussion of materials for application rates, page 5

### Post-bloom Application

(Apply immediately after fruit set)

Sulfur or	0	Citrus rust mites, partially controls Texas citrus mites and false spider mites.
Sulfur + dicofol (Kelthane)	7	Citrus rust mites, Texas citrus mites and false spider mites.

*If melanose is a problem, a spray application is recommended at post-bloom.*

### Additional Applications

(Apply as needed when infestations warrant)

Sulfur or	0	Citrus rust mites, partially controls Texas citrus mites and false spider mites.
Sulfur + dicofol (Kelthane)	7	Citrus rust mites, Texas citrus mites and false spider mites.

\*Refer to the discussion of materials for special use precautions and intervals between last application and harvest.

# COMPATIBILITY OF MATERIALS RECOMMENDED FOR USE ON CITRUS IN TEXAS

Materials	Azinphosmethyl (Guthion)	Carbaryl (Sevin)	Chlorobenzilate	Demeton (Systox)	Dicofol (Kelthane)	Dioxathion (Delnav)	Ethion	Malathion	Neutral Copper	Petroleum Oils	Phosphamidon	Sulfur	Tetradifon (Tedion)	Zineb
Azinphosmethyl (Guthion)	—													
Carbaryl (Sevin)	1	—												
Chlorobenzilate	1		—											
Demeton (Systox)				—										
Dicofol (Kelthane)					—									
Dioxathion (Delnav)						—								
Ethion			2		2	2	—							
Malathion								—						
Neutral Copper									—					
Petroleum Oils	×								×	—		×		
Phosphamidon											—			
Sulfur	1											—		
Tetradifon (Tedion)			2			2							—	
Zineb									3					—

## Legend:

Compatible ☐

Not Compatible ☒

## Footnotes:

<sup>1</sup>Use wettable powder formulations only.

<sup>2</sup>Not generally mixed together.

<sup>3</sup>Residual effectiveness of zineb may be reduced.

Nutritional sprays are compatible with most of the pesticides recommended in this guide. Do not use in combination with petroleum oils. Nutritional sprays are not generally recommended because of the economics involved. For additional information refer to B-1002, *Guide for Citrus Production in the Lower Rio Grande Valley*, or contact your local county Extension agent.

*This manuscript was prepared in cooperation with entomologists, plant pathologists and horticulturists of Texas A&M University, Entomology Research Division — USDA and the Texas College of Arts and Industries, Citrus Training Center, Kingsville.*