Res. 0-5000-12-4-69 1-559



Brown Soft Scale



California Red Scale

## TEXAS GUIDE Chaff Scale for Controlling Pests and Diseases on Citrus



Purple Scale



Glover Scales and Purple Scales (top)



Florida Red Scale

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

### TEXAS GUIDE FOR CONTROLLING PESTS AND DISEASES ON CITRUS

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

EFFECTIVE 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 method for scale insects. 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  $\frac{1}{2}$  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.

#### PROPER APPLICATION

Spraying is costly, and thorough coverage is necessary. Apply spray in such a manner as to wet all tree parts. In dilute spraying, apply 1 gallon of liquid per foot of tree height. If concentrate spraying is used, be sure that the same amount of actual pesticide per acre is used. Air blast sprayers should be pulled at a maximum of 1 mph. Certain spreader-stickers may be added to spray mixtures containing only wettable powders to prolong their effectiveness in case it rains 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. 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.

The lighter oils give less insecticidal activity but have less adverse effect on trees than do heavy oils.

Table 1.	Gallons	of	oil	spray	concentrate	per	500	gallons	of	spray
mixture										

Percent	Gallons of actual oil	needed to make
shown on label	1% mixture	1.6% mixture
97-99	5	8
80-84	6	10

Excessive use of oils has resulted in adverse effects on the trees, such as excessive leaf drop, twig dieback, reduction in fruit sugars, etc.

Tangerines and tangelos are more susceptible to oil effects than grapefruit and oranges; reduced oil rates should be used on these types of citrus.

#### Mixing Procedure and Precautions with Oil

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. Continue agitation until tank is empty to prevent separation of petroleum oils and other chemicals. *Do not apply oils to drouth-strickened trees*. Do not use oil when relative humidity is 30 percent or lower. Oil sprays applied during the fall may delay grapefruit

RECOMMENDED SPECIFICATIONS FOR CITRUS SPRAY OILS

		Light	Medium	Heavy
50 % Distillation temperature		410-425	430-450	455-470
Temperature spread for 10%-90% distilled		Max. 80	Max. 80	Max. 80
Unsulfonatable residue	Min. 92%	Min. 92%	Min. 92%	Min. 92%
Pour point	Max. +20	Max. +20	Max. +20	Max. +20
Gravity by ASTM D287, °API		Min. 34.5		

maturity, interfere with coloring of early harvested fruit and increase cold injury. Do not apply oil and sulfur in combination or within 30 days of each other.

#### 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 significantly reduced harmful pest infestations.

#### CAUTIONS ON USE OF CHEMICALS

Most insecticides and fungicides are poisonous and should be used with caution. Store pesticides 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; protective clothing and equipment should be worn when these are used.

Follow closely all precautions and safety rules on the label. 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 picking crews.

Heavy infestations of false spider mites may occur following repeated use of certain organo-phosphate materials.

#### 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 for certain varieties for maximum production. Every effort should be made to select materials, time applications and use recommended rates to avoid a reduction in pollinator populations.

#### ADDITIONAL INFORMATION

Specific information as to the selection, method of application and timing of the treatment that will most adequately meet individual grove requirements is available from your local county Extension agent.

#### **APHIDS**

Aphids occasionally may cause damage prior to and during the bloom period to the extent that control

4

is required on oranges, tangerines or tangelos. Only affected trees should be treated. Build-ups will commonly be noted on new foliage. Malathion, demeton, azinphosmethyl (Guthion), phosphamidon, and Meta-Systox-R 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  $2\frac{1}{2}$  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.

Texas leaf-cutting ants sometimes defoliate citrus trees. Cut ants can be controlled with methyl bromide if the colonies are not near trees. Mirex 450 cutting ant bait may be used at any place and is very satisfactory.

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 see B-1002, *Guide for Citrus Production in the Lower Rio Grande Valley*, or contact your local county Extension agent.

Material	%	Туре	Pounds Per Gallon
Chlorobenzilate	50	E.C.	4
Ethion	46.5	E.C.	4
Kelthane	42	E.C.	4
Delnav	47	E.C.	4
Guthion	22	E.C.	2
Malathion	56	E.C.	5
Trithion	50	E.C.	4
Tedion	12.3	E.C.	1
Systox	26.2	E.C.	2
Metasystox R	25	E.C.	
Petroleum Oils			
Neutral Copper			
Sevin	80	W.P.	
Zineb	75	W.P.	
Sulfur		W.P.	

#### CONCENTRATIONS OF PESTICIDE MATERIALS

E.C. means Emulsifiable Concentrate.

W.P. means Wettable Powder.

# SPRAY PROGRAM POST-BLOOM APPLICATION (Apply before fruit are ½ inch in diameter)

Zineb Chlorobenzilate Kelthane (dicofol) Ethion Guthion (azinphosmethyl) Trithion (carbophenothion) Nabac Wettable sulfur Delnav (dioxathion) Kelthane (dicofol) Ethion Guthion (azinphosmethyl) Trithion (carbophenothion) Delnav (dioxathion) *Oil Tedion (tetradifon) Kelthane (dicofol) Chlorobenzilate *Oil Nettable sulfur *Oil Suthion (azinphosmethyl) Aalathion	5 lb. $1 \frac{1}{2} - 2 \text{ pt.}$ 2  qt. 2  qt. $2 \frac{1}{2} \text{ pt.}$ $\frac{1}{2} \frac{1}{2} \text{ pt.}$ $\frac{1}{2} \frac{1}{2} \text{ pt.}$ $2 \frac{1}{2} \frac{1}{$	0 0 7 21 7 or 28 30 5 0 7 7 7 or 28 0 0 0 0 0 0 0 0 0	Zineb is unsatisfactory under hear infestations. Do not apply Ethion within 90 da of previous application. 7 days for one application of guthic 28 with two. Nabac unsatisfactory for concentra sprays. Do not use sulfur with oil or with 30 days of oil spray. 3 months on Delnav if fruit is prese Do not use oil if humidity is bela 30%. Tedion is unsatisfactory under hear infestations. Apply only once p season if fruit is present. Do not use oil if humidity is bela 30%.
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Trithion (carbophenothion) Nabac Wettable sulfur Delnav (dioxathion) Celthane (dicofol) Ethion Guthion (azinphosmethyl) Trithion (carbophenothion) Delnav (dioxathion) *Oil Tedion (tetradifon) Chlorobenzilate *Oil Nettable sulfur *Oil Suthion (azinphosmethyl) Aalathion	2 $\frac{1}{12}$ pt. $\frac{1}{12}$ pt. 25 lb. 2 qt. 2 qt. 2 qt. 1 gal. 2 $\frac{1}{12}$ pt. 2 qt. 5 gal. 1 gal. 2 qt. 5 gal. 5 gal. 5 gal. 5 gal.	30 5 0 7 21 7 or 28 30 0 0 0 7 0 0 0	Nabac unsatisfactory for concentra sprays. Do not use sulfur with oil or with 30 days of oil spray. 3 months on Delnav if fruit is preser Do not use oil if humidity is belo 30%. Tedion is unsatisfactory under heav infestations. Apply only once pr season if fruit is present.
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Kelthane (dicofol) Chlorobenzilate *Oil Wettable sulfur *Oil Guthion (azinphosmethyl) Aalathion	2 qt. 1 ½-2 pt. 5 gal. 25 lb. 5 gal.	7 0 0 0	Do not use oil if humidity is below 30 %.
Kelthane (dicofol) Chlorobenzilate *Oil Nettable sulfur *Oil Guthion (azinphosmethyl) Malathion	2 qt. 1 ½-2 pt. 5 gal. 25 lb. 5 gal.	7 0 0	Do not use oil if humidity is below 30%.
Kelthane (dicofol) Chlorobenzilate *Oil Wettable sulfur *Oil Guthion (azinphosmethyl) Malathion	2 qt. 1 ½-2 pt. 5 gal. 25 lb. 5 gal.	7 0 0	Do not use oil if humidity is belov 30 % .
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Wettable sulfur *Oil Guthion (azinphosmethyl) Malathion	25 lb. 5 gal.	0	30 %.
Wettable sulfur *Oil Guthion (azinphosmethyl) Malathion	25 lb. 5 gal.	0	
*Oil Guthion (azinphosmethyl) Malathion	5 gal.		
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Guthion (azinphosmethyl) Nalathion			ity is below 30%.
Malathion	1 gal.	7 or 28	
	ι gai.	/	bination, Ethion, & Malathion in com bination with oil give added scale control.
	A SALAR AND A STREET	1.591.010.00.00	
Suthion (azinphosmethyl)	l gal.	7 or 28	2 months on Trithion if fruit is pros
minor (carbophenomion)	2 /2 pi.	U	ent. Add oil to Trithion under heavy
			infestations.
*Oil	5 gal.		Do not use oil if humidity is below 30 % .
Veutral copper	3.75 lbs. Actual	0	
nan 97-99% oil is used.			
	SUMMER PROGRA	м	
			Do not use oil if humidity is below
Use 8 gallons of where inc	dicated for these pests.	als	30%. Do not use Trithion atten July 1.
*Oil + Sevin	8 gal. $+ 1\frac{1}{3}$ -3 lbs.	5	Do not use oil if humidity is below
	- Jan 1 - 12 - 150		July 1.
Suthion E.C.			
azinphosmethyl)	i gai.		Do not allow Sevin and oil to re-
azinphosmethyl) +			main in tank without agitation.
Oil	4 lbs. + 8 gal.		
Jse same materials as post-bloom			
	FALL PROGRAM		
Jse same materials as post-bloom	h.		
Control and	inder omersenni see litter		line of all delaws down in the
Control only U	nder emergency conditions.		Use of oil delays degreening—do not apply within 30-60 days of harvest. Do not use oil if humidity is below 30%.
		20123	
Same o	as summer program.		Use same precautions with oil.
non 97.00% oil is used			
	DUST PROGRA	M	
	Use 8 gallons of where inc Oil + Sevin iuthion E.C. szinphosmethyl) iuthion W.P. szinphosmethyl) + Oil se same materials as post-bloom Control only u Same of an 97-99% oil is used.	SUMMER PROGRA Use 8 gallons of oil plus post-bloom materi where indicated for these pests. P Oil + Sevin 8 gal. + 1½-3 lbs. inthion E.C. zzinphosmethyl) 1 gal. inthion W.P. zzinphosmethyl) + Oil 4 lbs. + 8 gal. se same materials as post-bloom. FALL PROGRAM ise same materials as post-bloom. Control only under emergency conditions. Same as summer program. an 97-99% oil is used. DUST PROGRAM	SUMMER PROGRAM   Use 8 gallons of oil plus post-bloom materials where indicated for these pests.   0 9   Oil + Sevin   8 gal. + 1½-3 lbs. 5   situbion E.C.   szinphosmethyl) 1 gal.   vithion W.P.   szinphosmethyl) 1 gal.   Same materials as post-bloom.   FALL PROGRAM   Same as summer program.   Same as summer program.   DUST PROGRAM

7

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