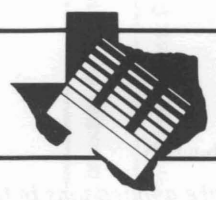


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Suggestions for Controlling *Rosette, Insects and Diseases* on Commercial Pecans

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Health and vigor of pecan trees plus satisfactory nut quality and yield depend on a well-planned and executed pest control program. Losses from insects and diseases can be greatly reduced by using effective grove management practices and by following suggested control procedures.

Zinc Nutrition

Pecans require zinc for normal stem and leaf growth. Trees not receiving zinc cannot produce the plant growth hormone, indoleacetic acid, and short clustered stems with small leaves result. This disorder is known as zinc rosette. Several zinc applications early in the season are required for optimum stem elongation and leaf expansion.

When and How to Spray

Preventing disease and insect losses requires strict adherence to properly timed spray applications. Table 1 specifies when to apply sprays in relation to tree development or pest occurrence. Thorough coverage of trees with each application is essential. With conventional, high-volume hydraulic sprayers, 1/2 to 1 gallon of spray mixture per foot of tree height is a general rule for the volume of finished spray required.

Maintain sprayer pressure at 300 to 400 pounds per square inch. Low volume sprayers (mist blowers, air blast sprayers, speed sprayers, etc.) utilize forced air as the carrier to deliver a concentrated spray mix and require proportionately less water. Concentrated spraying saves water and time but not pesticides since the same amount of pesticide is needed for each tree to obtain control. *Dilutions in the accompanying table of pesticide suggestions are for conventional hydraulic sprayers and aerial application. Adjustments in water/pesticide ratios are necessary for other types of equipment. Carefully follow the sprayer manufacturer's directions for mixing spray materials and calibration.*

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Commercial pecan producers must be able to recognize zinc rosette and major insect and disease pest problems. Detailed information on pest recognition, potential damage and development of life history can be found in the Extension Service publications, B-1238, *Pecan Insects of Texas* or MP-1272, *Pecan Diseases* which are available from your county Extension agent.

Chemical Use Precautions

Select suggested materials for most effective, safe, economical control. All suggested materials are poisonous, but proper handling reduces the hazards associated with use. Comply with manufacturers' label directions for handling all toxic chemicals.

Residues. The Environmental Protection Agency (EPA) has established pesticidal residue tolerances on pecans. These regulations establish the amount of a specific chemical that can be present in or on pecans at harvest. Always consult the product label for specific restrictions, and be sure the pesticide used is registered for use on pecans and is used only in accordance with specific application instructions.

Caution. All pesticides are poisonous to something; some are poisonous to man, animals and nontarget crops, etc. They should be used with caution and stored out of reach of children, irresponsible persons, livestock and household pets. Properly dispose of leftover spray materials and containers.

Pesticide Drift. Avoid drift to adjoining agricultural lands and take precautions against pond and stream contamination.

Symptoms of Poisoning. Some symptoms of pesticide poisoning are headaches, nausea, cramps, blurred vision, weakness, muscular twitching and diarrhea. If any of these symptoms occurs during or following the handling of any pesticide, consult a physician immediately.

Pollination and Bee Poisoning. Many agricultural and horticultural crops depend upon insects for pollination. Honey bee colonies are rented for pollination of fruit trees,

many vegetables, legume seeds and other crops. Bumble bees, alkali bees, alfalfa leafcutting bees and other wild bee species provide essential pollination in certain areas of Texas. Growers must take special precautions to protect these beneficial insects. The following suggestions are effective in reducing bee poisoning:

- Apply only "nonhazardous" pesticides to blooming crops where bees are foraging.
- Mow or shred orchard cover crop blooms before applying pesticide.
- Apply hazardous pesticides *only* when bees are not foraging. Early in the morning, late afternoon or at night are the periods of least bee activity. Use relatively nonhazardous pesticides whenever possible.
- Do not apply or allow pesticides to drift over wild bee nesting sites or honey bee colonies.
- Establish holding yards for honey bees at least 3 miles from orchard.
- Contact the beekeeper to remove bees from the area where bee losses are likely.
- Properly dispose of pesticides and pesticide containers so they will not become a bee-poisoning hazard.

Relative Bee Hazard of Pesticides Suggested for Commercial Pecans

Group 1 – Highly toxic at any time

- azinphosmethyl (Guthion®)
- carbaryl (Sevin®)
- diazinon (Spectracide® or Diazinon®)
- dimethoate (Cygon® or De-Fend®)
- lindane
- parathion

Group 2 – Hazardous if applied when bees are actively foraging. Apply in late evening, preferably when bees are not foraging.

- endosulfan (Thiodan®)

- esfenvalerate (ASANA®)
- malathion
- fenvalerate (Pydrin®)
- cypermethrin (Ammono® or Cymbush®)

Group 3 – Relatively nontoxic. Make applications in the late evening or early morning when bees are not foraging.

Insecticides:

- oil sprays

Fungicides:

- benomyl (Benlate®)
- thiophanate-methyl (Topsin-M®)
- triphenyltin hydroxide (Du-Ter®, Super Tin 4L®)
- propiconazole (Orbit 3.6 EC®)

Foliar nutrients:

- zinc sulfate zinc nitrate
- NZN Tracite-N-zinc
- ZN Special

Aerial Application of Fungicides and Insecticides.

Aerial application of fungicides and/or insecticides either by fixed wing or rotary aircraft has not proven as effective as ground applications. It can be used during unfavorable weather conditions which prevent use of ground equipment if disease potential is severe. Aerial applications are generally not successful on pecans because of tree height, density of leaf canopy and requirements for maximum coverage to achieve satisfactory disease control.

Alternate Fungicides in the Spray Program

To avoid the possibility of developing races of fungi that are not controlled with a particular fungicide, rotate fungicides during the season. Because of the extensive use of Benlate® for control of scab in the southeastern states, fungicide-resistant strains have developed. To prevent this from occurring in Texas, rotate the fungicides Du-Ter®, Super Tin 4L®, Triple Tin®, Orbit® or Cyprex® with Benlate® or Topsin-M®.

Suggestions made by the Texas Agricultural Extension Service and the Texas Agricultural Experiment Station on the use of pesticides are based on:

- Effectiveness under Texas conditions
- Avoidance of residues in excess of allowable tolerances
- Avoidance of toxicity to desirable vegetation, animals and humans
- Avoidance of adverse side effects upon beneficial predators, parasites, honey bees, fish and other wildlife, plants, animals and humans.

Suggested pesticides must be registered and labeled for use by the EPA and the Texas Department of Agriculture (TDA). Pesticides listed in this publication reflect use and restriction information from company labels at the time of printing. County Extension agents and appropriate specialists are advised of changes as they occur. The USER always is responsible for the effects of pesticide residues on livestock and crops, as well as problems that can arise from drift or movement of the pesticide from the user's property to that of others.

It has been reported that the population of scorch mite, *Eotetranychus hicoriae*, has been reported following the use of synthetic pesticides; therefore, when using these materials, watch for a buildup of this pest. Synthetic pesticides also can cause an increase in aphid numbers and honeydew on leaves.

Lindane, esfenvalerate, cypermethrin, fenvalerate and azinphosmethyl are classified as restricted-use pesticides by the EPA. Restricted-use pesticides can only be applied by a certified private applicator or under the direct supervision of a licensed private applicator. Persons who need to become certified should contact their county Extension agent or the TDA.

Always read and carefully follow the instructions on the container label. For further information, contact your county Extension agent or the Extension agricultural chemist, Texas A&M University (409) 845-3849.

Table 1. Suggestions for controlling rosette, insects and diseases on commercial pecans.

Time of application	Insects and diseases	Pesticide and formulation ¹	Concentrate per 100 gal water unless otherwise stated	Remarks
dormant (winter)	scale and phylloxera (galls)	dormant oil 97% oil emulsion	4 gals.	For phylloxera, spray tree trunk and branches thoroughly with dormant oil emulsion.
bud break	phylloxera (Where a history of phylloxera damage indicates a need for control, apply a labeled insecticide at bud break when growth is 1 to 2 inches long.)	endosulfan (Thiodan [®]) 50% WP 33.7% EC	1 1/2 lbs. 2/3 to 1 qt.	<i>Endosulfan</i> —Do not graze livestock in treated groves. Do not apply after shuck split.
		or		
		lindane (Lindane E-1 [®]) 12.5% EC	1 1/2 pts.	<i>Lindane</i> —(restricted-use pesticide)—Do not graze treated areas. Make only one application. Do not apply more than 450 gal. of or finished spray per acre.
		or		
		malathion 57% EC	1.2 pts.	<i>Malathion</i> —No grazing restrictions. May be applied up to the day of harvest.
		or		
		chlorpyrifos (Lorsban 4E [®])	2 pts.	<i>Chlorpyrifos</i> . Do not graze treated orchards.
	pecan scab, vein spot and downy spot	benomyl (Benlate [®]) 50% DF	Ground: 1/2 to 1 lb./acre Aerial: 1 lb./acre	<i>Benomyl</i> . Use the higher rates on trees more than 30 feet in height. Repeat application at 3- to 4-week intervals. Use close intervals during prolonged periods of high humidity. Benomyl is also registered for use against fungal leaf scorch. Do not apply after shucks or begin to open. Use higher rate for aerial application. No grazing restrictions.
		or		
		thiophanate-methyl (Topsin-M [®]) 70% WP	Ground: 1/2 to 1 lb./acre	<i>Thiophanate-methyl</i> . Use higher rate on trees more than 30 feet in height. Apply at 3- to 4-week intervals. Do not apply when shucks begin to open. Use higher rate for aerial application. No grazing restrictions.
		or		
		Topsin-M [®] 4.5 F 46.2% F	Ground: 10-20 fl oz./acre	No grazing restrictions.
		triphenyltin hydroxide (Du-Ter Flowable 30 [®]) 19.7%F	Ground: 17 to 25.5 fl. oz./A	<i>Triphenyltin hydroxide</i> . Use lower rate on small trees when disease pressure is not severe. Repeat at 2- to 4-week intervals. During prolonged periods of high humidity use the shorter interval. Do not apply after shucks begin to open. Also cleared for use on sooty mold and leaf blotch. Do not graze meat or dairy animals in treated area. Use higher rate for aerial application.

Time of application	Insects and diseases	Pesticide and formulation ¹	Concentrate per 100 gal water unless otherwise stated	Remarks
		or		
		triphenyltin hydroxide (Super Tin 4L [®]) 40% F	Ground: 8 to 12 fl. oz./A Aerial: 8 to 12 fl. oz./20 gals. water/acre	
		ziram (Ziram F-4 [®]) or (Ziram W-76 [®])	3 pts./100 gals. 2 lbs./100 gals.	Ziram - No grazing restrictions.
		or		
		propiconazole (Orbit 3.6 EC [®])	Ground: 4 to 6 fl. oz./A.	<i>Propiconazole.</i> Use high rate and short intervals (14 days) when environmental conditions favor disease development. Do not graze livestock in treated groves. Do not make more than 4 applications in one season. Use tractor equipped with cab to reduce exposure. Effective against scab, downy spot, fungal leaf scorch and brown leaf spot. Do not cut cover crop for feed.
	rosette	zinc sulfate 36% WP	2 lbs.	Zinc sprays are essential for early season pecan growth. Early, frequent applications will give the best response. Elemental zinc is toxic to most plants other than pecans and grapes; therefore, avoid drift to protect from phytotoxicity. If drift is a possibility, use NZN. Do not use any zinc product at higher than labeled rates since foliage burn can result. When applying more than one zinc spray in 2 weeks, reduce rate by one-half. Never spray young trees that are not actively growing.
		or		
		zinc nitrate 17% liquid	20 oz.	
		or		
		Tracite-N-Zinc [®] 17% liquid	1 qt.	
		or		
		NZN [®] 6% liquid	1 qt.	
		or		
		ZN Special [®] 13.5% WP	2 lbs.	

Time of application	Insects and diseases	Pesticide and formulation ¹	Concentrate per 100 gal water unless otherwise stated	Remarks
		or zinc sulfate 36% + Uran [®] 32% liquid N	2 lbs. + 1 qt.	Use only on trees with severe zinc rosette. Liquid nitrogen is especially corrosive to metal sprayer parts and can cause piston pumps to freeze.
		or zinc nitrate 17% + Uran [®] 32% liquid N	20 oz. + 3 pts.	
Prepollination (when leaves are one-third grown and before pollen is shed)	sawfly larvae, May beetles, pecan catocala, fall webworm, walnut caterpillar	See remarks		Some years an insecticide may be required to control spring foliage feeders. If they are present in damaging numbers, select an appropriate insecticide from those listed for the casebearer spray below. For pest identification, refer to B-1238 <i>Pecan Insects of Texas</i> .
	diseases (same as bud break)	Fungicides same as bud break		Same as bud break
	rosette	Zinc formulations same as bud break		Same as bud break
Casebearer (soon after pollination)	First generation pecan nut casebearer (Eggs are deposited on tips of nuts. Examine 300-400 nutlet clusters for greenish white eggs. Treat if 1% or more of the nutlet clusters have casebearer eggs or have been tunneled by casebearer larvae. Spray trees thoroughly when egg hatch is occurring.)	azinphosmethyl (Guthion [®]) 50% WP 35% WP 22.2% EC 22% EC (2S)	3/4 to 1 1/8 lbs. 1 to 1 1/2 lbs 1 1/2 to 2 1/4 pts. 1 1/2 to 2 1/4 pts.	<i>Azinphosmethyl</i> . (restricted-use pesticide)--Do not apply after shuck split. Do not graze livestock in treated groves for 21 days following treatment.
		or cypermethrin (Ammo [®] 2.5) 30.6% EC (Cymbush 3E [®]) 35.6% EC	3 to 5 oz./acre 2.56 to 4.27 oz./acre	
		or diazinon 50% WP 48% EC	2 to 6 lbs./acre 1 to 4 qts./acre	<i>Diazinon</i> . Do not apply after shuck split.
		or endosulfan (Thiodan [®]) 50% WP	1 to 1 1/2 lbs.	<i>Endosulfan</i> . Do not graze livestock in treated groves. Do not apply after shuck split.

Time of application	Insects and diseases	Pesticide and formulation ¹	Concentrate per 100 gal water unless otherwise stated	Remarks
		or esfenvalerate (Asana [®]) 24% EC	1 to 2 fl. oz.	<i>Esfenvalerate</i> . (restricted-use pesticide) Do not graze livestock in treated orchards. Do not exceed 5 ounces per acre per season and do not apply 21 days to harvest.
		or malathion 57% EC	1.2 pts.	<i>Malathion</i> . No grazing restrictions. May be applied up to the day of harvest.
		or chlorpyrifos (Lorsban 4E [®])	2 pts.	<i>Chlorpyrifos</i> . Do not graze treated orchards. Do not apply within 21 days of harvest.
	diseases (same as bud break)	Fungicides same as bud break		Same as bud break
	rosette	Zinc formulations same as bud break		Same as bud break
First cover spray: 14 days after casebearer spray	foliage and nut diseases (scab, powdery mildew and brown leaf spot)	Fungicides same as bud break		This application may be required during extended periods of high humidity.
	rosette	Zinc formulations same as bud break		Same as bud break
Second cover spray: 14 days after first cover spray	foliage and nut diseases	Fungicides same as bud break		This application may be required during extended periods of high humidity and on scab-susceptible varieties.
	rosette	Zinc formulations same as bud break		Same as bud break
Early to mid-July (approximately 42 days after the first generation pecan nut casebearer spray)	second generation pecan nut casebearer	Insecticides same as for first generation pecan nut casebearer		Growers should survey nut clusters for eggs. Apply insecticide when eggs begin hatching.
	diseases (same as second cover spray)	Fungicides same as bud break		Requirement for application same as second cover
	rosette	Zinc formulations same as bud break		Same as bud break
When present in damaging numbers. Yellow aphids usually require treating when they exceed 25 per compound leaf. Treat black aphids when they exceed three per compound leaf	aphids	dimethoate (De-Fend or Cygon [®]) 30.5% EC 43.5% EC	1 pt./acre 2/3 pt./acre	<i>Dimethoate</i> . Do not graze livestock in treated groves.

Time of application	Insects and diseases	Pesticide and formulation ¹	Concentrate per 100 gal water unless otherwise stated	Remarks
		or		
		esfenvalerate (Asana [®]) 24% EC	1 to 2 fl. oz	<i>Esfenvalerate</i> . (restricted-use pesticide) Do not graze livestock in treated orchards. Do not exceed 5 ounces per acre per season.
		malathion 57% EC	1 to 2 pts.	<i>Malathion</i> . No grazing restrictions. May be applied up to the day of harvest.
		or		
		chlorpyrifos (Lorsban 4E [®])	2 pts.	Black aphid control. Do not graze livestock in treated field. Do not apply within 28 days of harvest.
		or		
		chlorpyrifos (Lorsban 4E [®]) + Pydrin 2.4 EC [®]	1 pt. + 2 2/3 oz.	Yellow pecan aphid complex. Do not graze livestock in treated orchards. Do not apply within 21 days of harvest. Do not apply after shuck split. Refer to label for additional restrictions.
		or		
		Cymbush 3 EC [®]	2.6 oz.	
		or		
		Ammo 2.5 EC [®]	3 oz.	
Water stage (late July)	foliage and nut diseases (same as first cover spray)	Fungicides same as bud break		Time this application with the liquid endosperm stage of nut development.
Third cover spray: (early to mid- August)	fall foliage and nut diseases (scab)	Fungicides same as bud break		Requirements for application same as second cover spray.
Shell hardening stage	Damaging populations of hickory shuckworm generally are observed in mid-August. If infestations at harvest the previous year exceeded 20%, treatment is probably needed the current year. Sample shell hardening beginning in early August for a cross section of varieties. Spray when more than half the varieties have reached the half-shell hardening stage. Make a second application 10 to 14 days later	azinphosmethyl (Guthion [®]) 50% WP 35% WP 22.2% EC (2L) 22% EC (2S)	3/4 to 1 1/8 lbs. 1 to 1 1/2 lbs. 1 1/2 to 2 1/4 pts. 1 1/2 to 2 1/4 pts	<i>Azinphosmethyl</i> . (restricted-use pesticide) See remarks under first generation pecan nut casebearer spray.
		or		
		cypermethrin (Ammo [®] 2.5) 30 % EC (Cymbush 3E [®]) 35.6% EC	3 to 5 oz./acre 2.56 to 4.27 oz./acre	<i>Cypermethrin</i> . Do not graze livestock in treated orchards. Refer to label for additional restrictions. Do not apply after shuck split.
		or		
		chlorpyrifos (Lorsban 4E [®])		<i>Chlorpyrifos</i> . Do not graze treated orchards. Do not apply within 21 days of harvest.

Time of application	Insects and diseases	Pesticide and formulation ¹	Concentrate per 100 gal water unless otherwise stated	Remarks
		or carbaryl (Sevin®) 80% (80S) 41.2% (XLR) 43% (4F) 50% (50W)	2 to 3 lbs. 1 to 2 1/2 qts. 1 to 2 1/2 qts. 2 to 5 lbs.	<i>Carbaryl</i> . Do not apply after shuck split. Applications of carbaryl may cause flareups in aphid and mite populations. Survey orchards for aphids and mites 7 to 14 days following carbaryl applications.
		or esfenvalerate (Asana®) 24% EC Vendex 4L® 50% WP	1 to 2 fl. oz. 4 to 8 fl. oz.	<i>Esfenvalerate</i> . See remarks under first generation pecan nut casebearer spray. <i>Vendex</i> . Treat after July 1 if mites and light damage are observed. 14 days preharvest interval.
Gel stage	Pecan weevil adults emerge during August and September. Begin checking after the first week in August by spreading canvas beneath trees and jarring lower branches. When adult weevils are found, and nuts are gel stage or later, apply a spray. Repeat application if adult weevils continue to emerge at 10- to 14-day intervals. Cone emergence cages can also be used to indicate time of adult emergence. See L-1808, <i>Sampling for Adult Pecan Weevils in Texas</i> .	carbaryl (Sevin®) 80% (80S) 41.2% (XLR) 43% 4F 50% (50W)	2 to 3 lbs. 1 to 2 1/2 qts. 1 to 2 1/2 qts. 2 to 5 lbs.	<i>Carbaryl</i> . Do not apply after shuck split. Applications of carbaryl may cause flare-ups in aphids and mite populations. Survey orchards for aphids and mites 7 to 14 days following carbaryl applications.
¹ Pesticides listed alphabetically WP -- wettable powder EC -- emulsifiable concentration G -- granular F -- flowable S -- sprayable				

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