



INSECT CONTROL

Orchard Survey Procedures

Weekly scouting reports are used to estimate insect infestation levels. The scout or the grower inspects key scout trees to detect levels of infestation for each major pest. The number of scout trees depends on the total number of trees in the orchard; usually 5 to 10 percent are selected. Scout trees should be located so that all quadrants of the orchard are inspected. The preferred method is to scout every fourth tree in every fourth row.

Counts are made for aphids, scorch mites, and other leaf-feeding pests by examining five compound leaves per scout tree. Counts for nut casebearers and pecan spittlebugs are made by inspecting five nut clusters on each scout tree. Both nut clusters and leaves are also examined for signs of beneficial organisms.

Populations of hickory shuckworms and pecan weevils are sampled by using survey traps constructed especially for this task.

Low Impact Insecticides

Several pesticides are now available that are considered to have low impact on the environment. Most of these have very low mammalian toxicity, posing little or no threat to animals and humans. Also, many are target specific to a great degree, affecting only the pest species targeted and some related species. Beneficial arthropod populations are generally unaffected by the use of these chemicals. In this guide, materials considered to be low impact are indicated by the following symbol, .

Table 1. Pecan Insect Control

Insect	Insecticide and Formulation	Amount per Acre for Medium-Size Trees	Comments
Hickory Shuckworms			
	UP-CYDE or ASANA XL or BRIGADE WSB or CONFIRM 2F or DIMILIN 2L or IMIDAN 70WP or INTREPID 2F or LORSBAN 4E	3 oz. 5-6 oz. 1 lb. 8-16 oz. 8 oz. 2 lb. 4-8 oz. 2 pt.	Hickory shuckworms are present in pecan orchards throughout most of the season but are usually not found in significant numbers until June or later. Prior to shell hardening, the creamy white, brown-headed caterpillars feed inside nuts and cause them to drop. After shell hardening, the larvae feed in the pecan shuck, causing it to stick to the shell. Shuckworms can be adequately sampled only with blacklight traps. Treat if the number of adult moths captured equals or exceeds seven during any single trapping period or if three or more are captured for three consecutive trapping periods. If traps are not used and the orchard has a history of infestation, apply a spray in early June. Three more may be needed at 14-day intervals beginning the first or second week in August. <i>Add an effective spray adjuvant when using Confirm.</i>

Insect	Insecticide and Formulation	Amount per Acre for Medium-Size Trees	Comments
Pecan Nut Casebearers			
	CONFIRM 2F or IMIDAN 70WP or INTREPID 2F or LORSBAN 4E or PHASER 3EC or SPINTOR 2SC or DIMILIN 2L	8-16 oz. 1.5 lb. 4-8 oz. 2 pt. 1 qt. 4-8 oz. 8 oz.	Pecan nut casebearers are sporadic pests in Alabama. The most serious infestation normally occurs shortly after nuts are set (late May or early June). Adult moths lay small, flat, whitish eggs on the nuts—normally one egg per cluster. A hand lens may be needed to see the eggs. Emerging larvae ultimately feed on the nuts. One larva can destroy all the nuts in a cluster. A second generation in July can often cause significant damage to individual nuts. Treat when a thorough, random sample shows 6 percent of the nut clusters to have eggs, larvae, or damage during a normal crop year, or 4 percent when the crop is light. A second application may be required if infestations are heavy. Add an effective spray adjuvant when using Confirm. Timing is critical when using Spintor, which may not be suitable for heavy infestations without multiple applications. Dimilin, Confirm, and Intrepid are insect growth regulators and application should be targeted at the larval stage.
Phylloxera			
	LORSBAN 4E or PHASER 3EC or PROVADO 1.6F or TRIMAX PRO	2-4 pt. 1 qt. 3.5-7 oz. 1.7 oz.	Treat trees with a history of infestation and the surrounding trees as well. Time the treatment to coincide with budbreak fungicide sprays for earliest varieties. Heavy infestations may require a second application in conjunction with the prepollination fungicide spray.
Spittlebugs			
	IMIDAN 70W or PROVADO 1.6F or TRIMAX PRO or NUPRID 1.6F 	1-2 lb. 4 oz. 1.7 oz. 4 oz.	Pecan spittlebugs are occasional pests of pecan terminals. They are easily recognized by the white, frothy, spittle-like masses that cover the immature stages. Treat when spittle masses are found on more than 5 percent of the nut-bearing terminals inspected. Repeat as needed based on later samplings.

Insect	Insecticide and Formulation	Amount per Acre for Medium-Size Trees	Comments
Yellow Aphids			
	<p>Yellow aphids may be found in orchards all through the growing season. They are commonly found feeding on the undersides of leaves. In Alabama, yellow aphid populations are usually heaviest in May and June and again in August and September. They are most likely to require treatment during these population peaks. Treat if yellow aphid numbers exceed 30 per compound leaf after July 1.</p> <p>Honeydew, a sticky substance secreted by the aphids, serves as a medium for the growth of sooty mold fungi. A</p>		<p>heavy buildup of honeydew and sooty mold caused by a chronic but low aphid population may require treatment at times. In recent years, many growers have experienced difficulty in controlling yellow aphid populations. When choosing an insecticide for populations of these pests, be aware that the history of pesticide use in the orchard is important. Read the Comments that accompany the following insecticide choices when determining which materials to use in your orchard.</p>
	CENTRIC 40WG or FULFILL 50 WG or PROVADO 1.6F or TRIMAX PRO or NUPRID 1.6F or	2.5 oz. 4 oz. 3.5-7 oz. 1.5-3 oz. 3.5-7 oz.	<p>Fulfill activity is slower than most materials due to its mode of action. Allow sufficient time prior to evaluation and retreatment. Provado is a reduced-risk material with little impact on beneficial insects. Addition of an organo-silicone-based spray adjuvant at a rate not to exceed the manufacturer's recommended use rate may improve coverage and control. Overuse of foliar products containing imidicloprid (Provado, Nuprid, and Trimax) can lead to resistance. The label limits for active ingredient per acre should be considered when multiple products containing imidicloprid are used in the same season.</p>
	UP-CYDE or ASANA XL or BRIGADE 10WSB or MUSTANG MAX or WARRIOR or BAYTHROID XL or	3-5 oz. 5-6 oz. 1 lb. 3-4 oz. 3-5 oz. 2-2.4 oz.	
	UP-CYDE + LORSBAN 4E or PROVADO 1.6F + DIMETHOATE 4EC or PHASER 3EC	3 oz. 1 pt. 3.5 oz. 10 oz. 1 qt.	<p>Tank mixes may be advantageous in orchards where mites have been a problem and/or where single insecticides have given less than satisfactory results. Even when using tank mixes, it is not advisable to make more than two applications of a synthetic pyrethroid before alternating to another control strategy or material. This practice helps to prevent or delay the occurrence of pest resistance.</p>

Insect	Insecticide and Formulation	Amount per Acre for Medium-Size Trees	Comments
Yellow Aphids (cont.)			
	TEMIK 15G	See Comments.	Temik is a soil-applied granular insecticide that has proven excellent for suppression of aphids and mites. This material may be applied in Alabama as follows: (1) a single application prior to nut-set (June 1)– <i>a maximum of 9.9 pounds active ingredient per acre.</i> (2) two applications: the first prior to nut-set– <i>a maximum of 5 pounds active ingredient per acre;</i> the second prior to July 15– <i>a maximum of 3 pounds active ingredient per acre.</i> (3) a single, delayed application between July 1 and July 15– <i>a maximum of 3 pounds active ingredient per acre.</i> Survey regularly to detect any recurring aphid or mite problems.
	ADMIRE PRO	See Comments.	Admire is a systemic insecticide that is soil-applied in liquid formulation at a rate of 7 to 14 ounces per acre. The best time for application is May 15 to July 15. Admire can be applied either (1) through a drip or microsprinkler irrigation system (low pressure chemigation), (2) as a spot application adjacent to emitters, or (3) side-dress shanked into the root system near emitter lines. Proper operation of the irrigation system and/or rainfall occurrence is necessary for chemical uptake and efficacy. Maximum product per acre per season is 32 ounces per acre per season.
Black Pecan Aphids			
	Same as for Yellow Aphids or IMIDAN 70W or LORSBAN 4E or PROVADO 1.6F or TRIMAX PRO 	2 lb. 2 pt. 7-14 oz. 3-6 oz.	Black pecan aphids may be found in orchards as early as May but usually do not reach damaging levels until late summer. They may be found on both sides of pecan foliage. Their feeding causes bright yellow spots on the leaflets. The damaged tissue later turns brown, and injured leaflets may drop. Treat when a thorough survey reveals an average of one black aphid per compound leaf.
Mites			
	ACRAMITE 50WS or BRIGADE 10WSB or DICOFOL 4EC or KELTHANE MF or SAVEY 50DF or VENDEX 50WP or ENVIDOR 2SC or MICROTHIOL (sulfur)	0.75-1 lb. 1 lb. 4 pt. 4 pt. 3-6 oz. 2 lb. 14-18 oz. 5-10 lb.	Mites, especially pecan leaf scorch mite, have a seasonal distribution similar to black pecan aphid. They are not serious annual pests in all orchards but can cause serious damage when present in high numbers. Leaves damaged by mites normally have a bronzed or scorched appearance. Mite damage usually begins along leaflet midribs and spreads outward. Damage shows up first on low limbs in shaded, interior portions of the tree. After July 1, treat when mites and light damage are observed on the foliage of low limbs. Spot treatments are frequently possible. Savey controls mite eggs and immature mites only. Apply before populations get high.

Insect	Insecticide and Formulation	Amount per Acre for Medium-Size Trees	Comments
Pecan Weevils			
	DIMILIN 2L or IMIDAN 70WP or SEVIN 80S or MUSTANG MAX	8-16 oz. 3.125 lb. 3 lb. 3-5 oz.	Pecan weevils may emerge from the soil from late July into October in Alabama. Peak emergence is typically between August 10 and September 20. Use indicator trees with known weevil infestations for weevil detection. Sample weevils with traps. Cone emergence traps or a combination of cone traps and other types is preferred. Using Sevin knockdown sprays on indicator trees with canvas or plastic sheets spread beneath can also indicate weevil emergence. After shell hardening, treat when emergence increases and/or following rain during emergence periods. Continue treatments at 7- to 10-day intervals until emergence ceases. Three applications are usually sufficient. Aphids and mites may build up where Sevin is used (see above for control of aphids and mites). If aphids are present, adding an organo-phosphate material to the spray may prevent populations from flaring. Dimilin is for suppression ONLY and may require 2 to 3 years to reduce populations to low levels. Use Imidan at 7-day intervals ONLY where weevil populations are low to moderate.
Stinkbugs and Leaffooted Bugs			
	ASANA XL or BRIGADE WSB or UP-CYDE or MUSTANG MAX or PENNCAP-M or WARRIOR or PHASER 3EC or BAYTHROID XL	5-6 oz. 8-32 oz. 3-5 oz. 3-5 oz. 2-8 pts. 2.56-5.12 oz. 1 qt. 2-2.4 oz.	Stinkbugs and leaffooted bugs attack nuts throughout the growing season, causing abortion of nuts prior to shell hardening and bitter spot (black circular spots) on the kernels after shell hardening. Regularly scout fruiting terminals throughout the season until harvest. Monitor weeds growing in fence rows or on the orchard floor as well as agronomic crops in adjacent fields to identify stinkbug population buildup and movement into pecan orchards. Scouting should intensify as nuts near completion of ripening and other agronomic crops are harvested. Bitter spot injury can occur even after shucks on pecan nuts begin to split. Plant trap crops, such as pearl millet, soybeans, and cowpeas, in mid-summer along fence rows or on the orchard perimeter to attract stinkbugs and facilitate scouting as well as control. If orchards have heavy stinkbug pressure, minimize weed growth in and around the orchard throughout the year to eliminate alternate hosts for overwintering.

Other Insects

Insect pests other than those listed in Table 1 are considered to be of minor importance in most instances. These include leaf casebearers, nut and shoot curculios, fall webworms, walnut caterpillars, pecan budmoths, and leaf miners. If any minor pests occur in damaging numbers, see Table 2 for the proper control. Follow label recommendations.

Special Considerations

Alternative Chemicals. Certain insecticides listed are available in different formulations or under different trade names (e.g., Savit = Sevin). If you are using a formulation other than those listed, be sure it results in the proper amount of active ingredient per 500 gallons of spray mixture or amount applied per acre. Alternating insecticides is suggested when possible to reduce the chances of pesticide resistance or outbreaks of secondary pests.

Pesticide Rates. The amounts shown are for medium-size trees (25 to 35 feet) in rows 60 feet apart. On smaller trees, use three-fourths of the indicated amount; on larger trees, increase the amount by one-fourth.

Standard Rate vs. Concentrate (Low Volume) Sprays. When using the standard rate (1X), spray 12 to 20 gallons of mixture on each tree, depending on tree size. For concentrate (low-volume) spraying, increase the amount of pesticide in the mixture but spray less mixture per tree so that you still apply the same amount of pesticide to the tree. Research indicates that you can get good coverage and pest control with a 2X concentration: doubling the recommended pesticide rate in the spray and applying 6 to 10 gallons of mixture per tree. If you plan to concentrate spray, ask your sprayer sales representative or county Extension agent about nozzle and tractor speed information. You cannot get adequate pest control using an air blast sprayer with a tractor speed greater than 3 miles per hour.

Table 2. Control Ratings for Insecticides Registered for Use on Pecans

INSECTS	INSECTICIDES					
	Asana	Brigade 10WSB	Bt Products	Centric 40WG	Confirm	Cypermethrin
Black Pecan Aphid	2	2	--	2	--	2
Fall Webworm	--	--	2	--	1	--
Hickory Shuckworm	--	1	--	--	1	1-2
Leaf Miner	--	--	--	--	--	4
Leaf Scorch Mite	--	1	--	--	--	4
Nut Casebearer	--	--	1-2	--	1	1-2
Nut Curculio	--	--	--	--	--	--
Pecan Bud Moth	--	--	1-2	--	1	1
Pecan Weevil	--	--	--	--	--	3-4
Phylloxera	--	--	--	--	--	1-2
Plant Bug	--	--	--	--	--	1
Spittlebug	--	--	--	--	--	--
Stink Bug	--	1	--	--	--	1
Walnut Caterpillar	--	--	1-2	--	1	--
Yellow Aphid	2-3	2	--	2	--	2

continued

KEY TO CONTROL RATINGS

1 = Excellent; 2 = Good; 3 = Moderate; 4 = Poor; -- = Information not available.

Table 2. Control Ratings for Insecticides Registered for Use on Pecans (cont.)

INSECTS	INSECTICIDES					
	Dimethoate 2.6EC	Dimilin 2L	Fulfill 50WG	Imidan 50WP	Kelthane MF	Lorsban 4E
Black Pecan Aphid	3-4	--	2	3	--	2
Fall Webworm	--	--	--	--	--	--
Hickory Shuckworm	--	1	--	2	--	3
Leaf Miner	--	--	--	--	--	--
Leaf Scorch Mite	--	--	--	4	1	3
Nut Casebearer	--	1	--	2	--	--
Nut Curculio	--	--	--	--	--	--
Pecan Bud Moth	--	--	--	2-3	--	--
Pecan Weevil	--	2	--	2-3	--	--
Phylloxera	--	--	--	--	--	1
Plant Bug	--	--	--	--	--	--
Spittlebug	--	--	--	--	--	--
Stink Bug	--	--	--	--	--	--
Walnut Caterpillar	--	--	--	--	--	--
Yellow Aphid	3-4	--	1-2	4	--	3

continued

KEY TO CONTROL RATINGS

1 = Excellent; 2 = Good; 3 = Moderate; 4 = Poor; -- = Information not available.

Table 2. Control Ratings for Insecticides Registered for Use on Pecans (cont.)

INSECTS	INSECTICIDES							
	Intrepid	Mustang Max	Phaser 3EC	Provado	Sevin 80S	Spintor 2SC	Temik 15G	Warrior
Black Pecan Aphid	--	2	1-2	1-2	3-4	--	1	1-2
Fall Webworm	--	--	--	--	1	1	--	--
Hickory Shuckworm	1	1	2-3	--	2	2-3	3-4	1
Leaf Miner	--	--	--	--	4	--	1-2	--
Leaf Scorch Mite	--	--	4	--	4	--	1-2	--
Nut Casebearer	1	--	2-3	--	1-2	1	3-4	--
Nut Curculio	--	--	--	--	1	--	--	--
Pecan Bud Moth	--	--	--	--	2	1	2	--
Pecan Weevil	--	2	--	--	1	--	4	--
Phylloxera	--	--	1	1	--	--	2-3	--
Plant Bug	--	1	2-3	--	3-4	--	2	1
Spittlebug	--	--	2	1	1	--	1	--
Stink Bug	--	1	2-3	--	3-4	--	2	1
Walnut Caterpillar	1-2	--	2	--	1	1	--	--
Yellow Aphid	--	2	2	1	3-4	--	1	2

KEY TO CONTROL RATINGS

1 = Excellent; 2 = Good; 3 = Moderate; 4 = Poor; -- = Information not available.

Table 3. Properties of Insecticides and Acaricides Used on Pecans That May Affect Water Quality

Material	Surface-Loss Potential ¹	Leaching Potential ²
Asana	Large	Small
Cypermethrin	Large	Small
Dicofol	Small	Medium
Dimethoate	Small	Medium
Imidan	Medium	Small
Lorsban	Medium	Small
Mustang	Large	Small
Sevin	Medium	Small
Temik	Small	Large
Phaser	Large	Small
Vendex	Large	Small

¹ The surface-loss potential indicates the tendency of the pesticide to move with sediment in runoff.² The leaching potential indicates the tendency of the pesticide to move in solution with water and to leach below the root zone.**NOTE:** Differences in formulations, application mode (e.g., bare ground versus crop canopy), and soil type will affect how these ratings are used.**SOURCE:** Most ratings are derived from the USDA-ARS Interim Pesticide Properties Data Base, Version 1.0 by R.D. Wauchope and the surface-loss and leaching potentials by the Soil Conservation Service.

Table 4. Seasonal Occurrence of Pecan Insect and Mite Pests

Pests	Stage Of Development:										
	Month:	D Mar.	BB Apr.	PO May	June	NS July	WS Aug.	SH Sept.	KD Sept.	SS Oct.	H Nov.
Foliage Pests											
Leaf Casebearers			////	-----	-----	-----	-----	-----	-----	-----	-----
Leaf Phylloxeras			--////	---		-----					
Cigar Casebearers			////	-----	-----	-----	-----	-----	-----	-----	-----
Yellow Aphids					-----	////////	-----	////////	-----	-----	-----
Leaf Miners					-----	-----	////////	////////	////////	////////	-----
Black Aphids					-----	-----	-----	////////	////////	////////	-----
Mites					-----	-----	-----	////////	////////	////////	-----
Walnut Caterpillars					--////	---			-----		
Fall Webworms					-----	-----	-----	----/---			
May Beetles					--////	-----					
Budmoths					-----	////////	-----	-----	-----	-----	-----
Nut Pests											
Pecan Weevils							-----	////////	////////	////////	////////
Nut Casebearers					-----	////////	-----	////////	-----	-----	-----
Hickory Shuckworms					-----	-----	-----	////////	////////	////////	////////
Spittlebugs					--//	-----	----/---	-----	-----	-----	-----
Plant and Stink Bugs					-----	-----	-----	////////	////////	////////	-----
KEY TO RATINGS AND ABBREVIATIONS: D = Dormant NS = Nut Swell KD = Kernel Development ---- May be present BB = Budbreak WS = Water Stage SS = Shuck Split //// Most critical period (normally) PO = Pollination SH = Shell Hardening H = Harvest											

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DISEASE CONTROL

Timely fungicide sprays applied at recommended rates are necessary for a successful pecan crop. The first sprays must be applied in time to protect the developing foliage and nuts against fungal infection. Early application of fungicides is particularly essential because prevention of early-season buildup will reduce scab incidence throughout the remainder of the growing season.

Cover sprays are scheduled with specific time intervals between sprays to ensure that a protective fungicide cover is always present. Extremely wet, humid periods, which encourage disease development or exceptionally high pest populations, may necessitate additional sprays. Be sure to record the date when you apply each spray because the timing of cover sprays is based on the time of the previous spray. The conditions that encourage disease development (such as extremely wet weather) or orchards containing cultivars that are predominantly susceptible to scab may necessitate additional fungicide applications. See Tables 7 and 8 for the susceptibility of cultivars.

The severity of late-season shuck diseases (*Glomerella*) depends on the degree of tree stress that the orchard is subject to. Excessive or insufficient rainfall, tree canopy density, heavy crop load, lack of sunlight, insect and disease pressure, and unsuitable cultivars all increase stress in the orchard. Control of late-season diseases depends on a carefully managed early-season fungicide spray program. The critical period for fungal infection appears to be from budbreak through late May. Thus, proper timing and application of early-season sprays are important for controlling disease.

Disease resistance management is a primary concern in pecan production because of the sensitivity of the triazole

fungicides. Enable and Orbit are both triazole fungicides. Triazole fungicides can exert selection pressure on disease organisms and may cause a population shift to organisms with reduced susceptibility to the triazoles as a group (such as both Enable and Orbit). For this reason, it is recommended that neither Enable nor Orbit be used alone or in an alternating spray program with one another throughout the entire growing season. Enable should be tank mixed with Super Tin or Agri Tin, or the Orbit/Super Tin or Enable/ Agri Tin co-packs should be used during cover sprays. This will assure long-term efficacy of these products.

Pecan growers should select either a **block spray program** or a **full-season spray program** to follow during the season. For a block spray program, the best choices are using either Enable 2E, Enable/Agri Tin co-pack, or the Orbit/Super Tin co-pack at 10- to 14-day intervals from budbreak through pollination. This will usually require a total of three fungicide applications followed by a cover spray program of Super Tin or Agri Tin at 14- to 21-day intervals to the end of August. Shorten spray intervals if weather conditions favor disease development.

A full-season spray program requires only one fungicide or one combination of fungicides for the full season. Alternative fungicides for this program include Agri Tin, Super Tin, or the Orbit/Super Tin or Enable/Agri Tin co-packs, or a combination of a half-rate tank mix of Enable 2E with Agri Tin or Super Tin.

Apply the fungicides at 10- to 14-day intervals from budbreak through pollination. Apply at 14- to 21-day intervals during the cover spray period to the end of August. Shorten spray intervals if weather conditions favor disease development.

Table 5. Properties of Fungicides Used on Pecans That May Affect Water Quality

Common Name	Trade Name	Surface-Loss Potential ¹	Leaching Potential ²
Dodine Acetate	Syllit, Dodine, Elast F	Large	Small
Propiconazole	Orbit, Propimax	Medium	Medium

¹ The surface-loss potential indicates the tendency of the pesticide to move with sediment in runoff.

² The leaching potential indicates the tendency of the pesticide to move in solution with water and to leach below the root zone into deep percolation.

Table 6. Pecan Disease Control

Disease	Fungicide and Formulation	Amount per Acre for Medium-Size Trees	Comments
Budbreak			
Time of Spray: Just as buds begin to split and show green			
Scab, Downy Spot			
	AGRI TIN	See label.	Begin applications at prepollination stages when the young leaves are unfolding. A wetting agent (such as LATRON B-1956) should be added to Enable and Enable/Agri Tin to achieve optimum disease control. DO NOT alternate triazole fungicides (such as Enable or Orbit) full season. DO NOT use Enable/Agri Tin co-pack, or Enable + Super Tin, or the Orbit/Super Tin co-pack in cover sprays if either Orbit or Enable are used alone for prepollination sprays. DO NOT use Enable alone in postpollination sprays. Overuse of triazole fungicides (such as Enable or Orbit) can allow strains of the scab fungus that has reduced sensitivity to these products to flourish. DO NOT use more than three consecutive triazole fungicide sprays without an intervening application of a non-triazole fungicide (such as Super-Tin). DO NOT apply more than 1.5 quarts of Enable per acre per season. The Orbit/Super Tin and the Enable/Super Tin co-packs consist of two water soluble packages which must be used together. DO NOT use them separately. DO NOT open Super Tin or Agri Tin water-soluble packs. DO NOT use Elast F on Moore, Van Deman, Shawnee, Barton, or other susceptible cultivars. To avoid possible plant injury, DO NOT use any surfactant with Elast or the Elast + Enable tank mix. Apply Propimax on a 14-day schedule. Under severe disease conditions, use the high rate. DO NOT exceed four applications or 32 ounces per acre per growing season. DO NOT apply more than 30 ounces of Stratego per acre per season. DO NOT apply more than three sequential applications of Stratego before alternating with a fungicide with a different mode of action. DO NOT make more than three applications of Stratego or other strobilurin-containing fungicide (Abound, Pristine, Sovran) per acre per year. CRITICAL: Proper timing and application of the early-season sprays are necessary to reduce late-season diseases such as Glomerella shuck and kernel rot. Use the higher rate of Sovran in orchards with a history of high scab pressure or during wet periods. DO NOT make more than three consecutive applications of Sovran. DO NOT make more than two sequential applications of Pristine before alternating to a non-strobilurin fungicide. DO NOT use Elast full season.
	or ENABLE/AGRI TIN	See label.	
	ENABLE 2E	8 oz.	
	or ENABLE 2E	4 oz.	
	+ ELAST F	2.5 oz.	
	or ENABLE 2E	4 oz.	
	+ SUPER TIN 80WP	3.75 oz.	
	or SUPER TIN 4L	4-6 oz.	
	or HEADLINE	6-7 oz.	
	or ORBIT 45WP/ SUPER TIN 80WP	See label.	
	or PRISTINE	10-14.5 oz.	
	or PROPIMAX EC	4-8 oz.	
	or SUPER TIN 4L	8-12 oz.	
	or SUPER TIN 80WP	7.5 oz.	
	or SOVRAN	2.4-3.2 oz.	
	or STRATEGO	10 oz.	
Prepollination Spray			
Time of Spray: When catkins are green and flowers are beginning to show (14 days after Budbreak Spray)			
Scab, Downy Spot			
	Same as for Budbreak Spray		This spray and the Budbreak Spray are essential for control of scab. Thorough coverage is essential to prevent scab from becoming established in the orchard. Review Comments under Budbreak section.
Pollination Spray			
Time of Spray: When catkins are shedding; nut tips & stigma turning dark brown (14 days after Prepollination Spray)			
Scab, Downy Spot			
	Same as for Budbreak Spray		This spray is also important in controlling early scab buildup. Review Comments under Budbreak section.

Disease	Fungicide and Formulation	Amount per Acre for Medium-Size Trees	Comments
Cover Sprays			
Time of Spray: 14 days after Pollination Spray AND every 21 days thereafter until the end of August*			
Scab, Brown Spot, Downy Spot			
ABOUND or AGRI TIN or ENABLE/AGRI TIN or ENABLE 2E + SUPER TIN 80WP or SUPER TIN 4L or ORBIT 45WP/ SUPER TIN 80WP or PRISTINE or QUILT or SOVRAN or SUPER TIN 80WP or SUPER TIN 4L	6.2-12.3 oz. See label. See label. 4 oz. 3.75 oz. 4-6 oz. See label. 10-14.5 oz. 14-27.5 oz. 3.2-4.8 oz. 7.5 oz. 8-12 oz.	A continued fungicide program is necessary to keep both foliage and developing nuts healthy. Fungicide applications for scab control may be omitted after August 30 provided the scab incidence is low and climatic conditions are not extremely humid. Abound may reduce damage from Anthracnose (<i>Glomerella</i>). The addition of a non-ionic surfactant may improve coverage of Abound. Use the higher rate of Abound or a shorter spray interval when weather conditions favor disease development. DO NOT make more than six applications of Abound per acre per year. A wetting agent (such as LATRON B-1956) should be added to Enable and Enable/Agri Tin co-pack to achieve optimum disease control. The Orbit/Super Tin and Enable/Agri Tin co-packs consist of two water-soluble packages which must be used together. DO NOT use them separately. Use Orbit/Super Tin co-pack, the Enable/Agri Tin co-pack, or Enable plus Super Tin tank mix for controlling zonate leaf spot, fungal leafscorch, downy spot, vein spot, or liver spot. DO NOT alternate triazole fungicides (such as Enable or Orbit) full season. DO NOT use Enable/Agri Tin co-pack, Orbit/Super Tin co-pack, or Enable + Super Tin in cover sprays if either Orbit or Enable are used alone for prepollination sprays. DO NOT use Enable alone in postpollination sprays. Overuse of triazole fungicides (such as Enable or Orbit) can allow strains of the scab fungus with reduced sensitivity to these products to flourish. DO NOT apply more than 1.5 quarts of Enable per acre per season. Late-season fungicide applications are ineffective in controlling <i>Glomerella</i> shuck and kernel rot. DO NOT open Super Tin or Agri Tin water-soluble packs. DO NOT apply Sovran as the final spray in the season. DO NOT alternate Abound, Sovran, or Stratego sprays full season, and DO NOT make more than three consecutive sprays of these products before changing to Super Tin or Agri Tin for at least two sprays. Use the higher rate of Sovran in orchards with a history of high scab pressure or during wet periods. DO NOT make more than three consecutive applications of Sovran. DO NOT use any surfactant with the Dodine + Enable tank mix. DO NOT apply more than 30 ounces of Stratego per acre per season. DO NOT apply more than three sequential applications of Stratego before alternating with a fungicide with a different mode of action. DO NOT make more than three applications of Stratego or other strobilurin-containing fungicide (Abound, Pristine, Sovran) per acre per year. DO NOT make more than two sequential applications of Pristine before alternating to a non-strobilurin fungicide.	
Powdery Mildew			
ENABLE 2E MICROTHIOL DISPERS (sulfur)	8 oz. 5-10 lb.	DO NOT apply more than 1.5 quarts per acre per season. If powdery mildew begins to develop, combine sulfur with a fungicide used for controlling scab. DO NOT tank mix sulfur with Elast.	

*During periods when weather conditions favor disease development or when disease pressure is high, it may be necessary to apply fungicides on a 14-day schedule.

Disease	Fungicide and Formulation	Amount per Acre for Medium-Size Trees	Comments
Cover Sprays (cont.)			
Time of Spray: 14 days after Pollination Spray AND every 21 days thereafter until the end of August*			
Powdery Mildew, Zonate Leafspot			
	AGRI TIN +	See label.	DO NOT apply Topsin M after shuck split. Always apply Topsin M with another fungicide. A half rate of Super Tin or Agri Tin can be used in orchards where scab resistance to Topsin M has not occurred.
	TOPSIN M WSB or	1 lb.	
	SUPER TIN 80WP +	7.5 oz.	
	TOPSIN M WSB or	1 lb.	
	SUPER TIN 4L +	8-12 oz.	
	TOPSIN M WSB	1 lb.	

*During periods when weather conditions favor disease development or when disease pressure is high, it may be necessary to apply fungicides on a 14-day schedule.

Table 7. Disease Susceptibility Ratings of Pecan Cultivars Commonly Found in Older Orchards in the Southeast

Cultivar	Disease		
	Scab	Downy Spot	Fungal Scorch
Elliott	1.4	1	3
Davis	1.7	--	3
Curtis	2.0	3	2
Farley	2.4	2	2
Owens	2.5	4	2
Moreland	2.7	--	--
Cape Fear	2.8	2	4
Brooks	3.0	--	--
Moneymaker	3.0	5	4
Stuart	3.0	5	2
Moore	3.4	--	3
Pabst	3.7	--	3
Van Deman	3.7	--	4
Success	3.8	3	--
Desirable	3.9	2	2
Alley	4.0	--	3
Frotscher	4.0	--	3
Mobile	4.0	--	3
Mahan	4.1	3	--
Delmas	4.3	--	3
Schley	4.3	1	4

KEY TO RATINGS

1 = No incidence of pests; 5 = Very severe incidence;
 -- = Information not available.

Rosette (Zinc Deficiency)

Foliar sprays with zinc are suggested for a rapid, temporary correction of zinc deficiency. Use foliar zinc sprays only when zinc deficiency has been positively diagnosed, preferably by leaf analysis. Applying zinc to trees that are not zinc-deficient may reduce yields. For trees with diagnosed zinc deficiency (less than 50 parts per million

Table 8. Disease Susceptibility Ratings of Pecan Cultivars Suggested for Planting in the Southeast

Cultivar	Disease		
	Scab	Downy Spot	Fungal Scorch
Jubilee	1.1	--	--
Melrose	1.1	--	2
Elliott	1.4	1	3
Gloria Grande	1.4	--	3
Davis	1.7	--	3
Sumner	1.9	2	2
Kiowa	2.5	2	1
Owens	2.5	4	2
Jackson	2.6	--	2
Moreland	2.7	--	--
Cape Fear	2.8	2	4
Pawnee	2.9	2	2
Shawnee	3.0	3	1
Stuart	3.0	5	2
Surprize	3.0	--	--
Maramac	3.3	--	1
Woodward	3.4	--	--
Forkert	3.9	4	2
Desirable	3.9	2	2

KEY TO RATINGS

1 = No incidence of pests; 5 = Very severe incidence;
 -- = Information not available.

zinc in leaves), apply 35 to 50 pounds of zinc (100 to 140 pounds of 36-percent sulfate) per acre and disk into top 6 inches of soil. In addition, apply foliar sprays according to Table 9. Further zinc applications, if necessary, should be made on the basis of foliar analysis results from monitor trees not sprayed with zinc.

Table 9. Foliar Zinc Sprays Suggested for Zinc-Deficient Pecan Trees¹

Spray No. ²	Time to Spray	Formulation	Amount per 100 Gallons	Amount per Acre
1	Budbreak	zinc sulfate (36%)	2-4 lb.	8 lb.
2	2 weeks after budbreak	or		
3	4 weeks after budbreak	NZN		5 qt.
4	7 weeks after budbreak		1.25-2.5 qt.	
5	12 weeks after budbreak			

¹ Trees with less than 50 ppm zinc in leaves.

² If fewer sprays are to be applied, omit the third and/or fifth sprays. For zinc-deficient non-bearing trees, continue sprays at 3-week intervals until August.

Table 10. Pest Management for Non-Bearing Pecan Orchards

Disease and Insect	Fungicide and Insecticide	Amount per 100 Gallons*	Comments
Budbreak			
Time of Spray: Just as the buds begin to split and show green			
Foliar Diseases			
AGRI TIN		See label.	Refer to Comments under Budbreak section in Table 6.
or ENABLE/AGRI TIN		See label.	
or SUPER TIN 80WP		5 oz.	
or SUPER TIN 4L		8 oz.	
or ENABLE 2E		4 oz.	
+			
SUPER TIN 80WP		3.75 oz.	
or ENABLE 2E		4 oz.	
+			
SUPER TIN 4L		4-6 oz.	
or ORBIT 45WP/SUPER TIN 80 WP		See label.	
Hickory Shoot Curculios			
PHASER 3EC		1 qt.	Apply curculio sprays at budbreak for the earliest cultivar. If repeat applications are needed, apply Phaser or Imidan after a 10- to 14-day interval.
or IMIDAN 70WP		3 lb.	
Pecan Bud Moths			
CONFIRM 2F		8 oz.	
or INTREPID 2F		4-8 oz.	
Cover Sprays			
Time of Spray: Three weeks after budbreak spray and as needed throughout the season			
Aphids			
PROVADO 1.6F		3.5-7 oz.	Observe the treatment "action levels" for bearing trees when making aphid control decisions. Fungicides are usually not necessary after foliage has matured (June 1). If disease pressure is high, additional fungicide applications may be needed.
or NUPRID 1.6F		3.5-7 oz.	
or TRIMAX PRO		1.5-3 oz.	
Foliar Diseases			
SUPER TIN 4L		See label.	Refer to Comments under Cover Sprays section in Table 6.
SUPER TIN 80WP		See label.	
or AGRI TIN		See label.	

*Based on dilute sprays of 150 gallons per acre.

FUNGICIDE AND INSECTICIDE RATES

Correct fungicide and insecticide rates are essential for good disease and insect control. Each tree should receive the amount of pesticide recommended in the spray schedule.

The volume of spray necessary to cover a tree thoroughly will vary with the type of sprayer used. The correct spray concentration, therefore, is determined by the volume of spray each tree receives. The various pesticide concentrations or the amounts of formulations to prepare 500 gallons of spray are

indicated in Table 11. The rates are established for medium-size trees between 25 and 35 feet tall. For trees less than 25 feet tall, use 25 percent less material or multiply the amount recommended for medium trees by 0.75.

For trees more than 35 feet tall, apply 25 percent more material or multiply by a factor of 1.25. Rates listed here reflect the lowest rate recommended if a range is listed on the label. Adjust the rate according to your situation.

Table 11. Recommended Fungicide and Insecticide Rates for Pecans

Pesticide and Formulation	Amount of Formulated Material per Medium-Size Tree	Gallons of Spray Applied to Medium Tree						
		20	18	15	12	10	7.5	5
		Pounds of Wettable Powder per 500 Gallons						
Brigade 10WSB	0.08 lb.	2.0	2.2	2.6	3.4	4.0	5.4	8.0
Imidan 70WP	0.20 lb.	5.0	5.6	6.6	8.4	10.0	13.4	20.0
Sevin 80S	0.25 lb.	6.25	7.0	8.3	10.4	12.5	16.7	25.0
Super Tin 80WP	0.04 lb.	1.0	1.1	1.3	1.7	2.0	2.7	4.0
Syllit 65WP	0.17 lb.	4.2	4.6	5.6	7.0	8.4	11.1	16.7
Vendex 50WP	0.17 lb.	4.2	4.6	5.6	7.0	8.4	11.1	16.7
		Pints of Liquid Formulation per 500 Gallons						
Dimethoate	1.33 oz.	2.1	2.3	2.8	3.5	4.2	5.5	8.4
Kelthane MF	2.67 pt.	2.2	4.6	5.6	7.0	8.4	11.0	16.8
Lorsban 4EC	0.08 pt.	2.0	2.2	2.6	3.4	4.0	5.4	8.0
Penncap M	0.17 pt.	4.2	4.6	5.6	7.0	8.4	11.1	16.7
Phaser 3EC	0.20 pt.	5.0	5.6	6.6	8.4	10.0	13.4	20.0
		Fluid Ounces of Liquid Formulation per 500 Gallons						
Mustang	0.25 fl.oz.	6.25	7.0	8.3	10.5	12.5	16.7	25.0
Asana 1.9E	0.42 fl.oz.	10.5	11.7	14.0	17.5	21.0	31.5	42.0
Confirm 2F	0.67 fl.oz..	16.5	18.3	22.0	27.5	33.0	44.0	66.0
Enable 2E	0.66 fl.oz.	16.5	18.3	22.0	27.5	33.0	44.0	66.0
Mustang Max	0.25 fl.oz.	6.25	7.0	8.3	10.5	12.5	16.7	25.0
Intrepid 2F	0.33 fl.oz.	8.3	9.2	11.0	13.7	16.7	22.0	33.0
Orbit 3.6E	0.33 fl.oz.	8.3	9.2	11.0	13.7	16.7	22.0	33.0
Provado 1.6F	0.33 fl.oz.	8.3	9.2	11.0	13.7	16.7	22.0	33.0

Table 12. Restrictions and Residue Tolerances for Fungicides and Insecticides Used on Pecans

Chemical	Tolerance Residue (ppm)	Comments
Abound	---	DO NOT apply within 45 days of harvest. DO NOT apply more than 2.3 quarts of product per acre per year. DO NOT make more than six applications per acre per year.
Acramite 50WS		DO NOT make more than one application per season. Do not harvest within 14 days of last application.
Admire Pro		DO NOT apply more than 14 fluid ounces per acre per season.
Agri Tin	---	DO NOT apply more than ten treatments during a single growing season. DO NOT apply after the shucks have started to open. DO NOT open water-soluble packs.
Asana	---	DO NOT feed or graze livestock on treated orchard floor. DO NOT exceed 0.3 pound active ingredient per acre per season. DO NOT exceed 5 fluid ounces of Asana 1.9E per acre per treatment. DO NOT apply within 21 days of harvest.
Baythroid XL		DO NOT apply within 14 days of harvest. DO NOT apply more than 2.8 fluid ounces per acre per season.
Brigade	--	DO NOT exceed 0.2 pound active ingredient per acre per application or 0.50 pound active ingredient per acre per season. DO NOT graze livestock in treated orchards. DO NOT apply within 21 days of harvest nor with less than 15-day intervals.
Centric	--	DO NOT apply more than 5 ounces of 40WG per acre per season. Allow 7 days between application. DO NOT apply within 14 days of harvest.
Confirm	---	DO NOT apply more than 80 ounces per season. DO NOT apply within 14 days of harvest. DO NOT graze livestock in treated areas. DO NOT feed cover crops grown in treated areas to livestock.
Cypermethrin (Up-Cyde)	0.05	DO NOT apply more than 0.6 pound active ingredient per acre per season. DO NOT apply after shuck split. DO NOT graze livestock in treated orchard or cut treated cover crops for food. Cypermethrin is a RESTRICTED USE pesticide.
Dimethoate	0.1	DO NOT graze livestock in treated orchards. DO NOT harvest within 21 days of application.
Elast	---	DO NOT use alone full season. DO NOT graze livestock in treated area. DO NOT apply after shucks start to open.
Enable	---	DO NOT apply after shuck split or within 28 days of harvest. DO NOT apply more than 1.5 quarts per acre per season.
Enable/Agri Tin	---	DO NOT open water soluble packs and DO NOT use separately. DO NOT apply after shucks begin to open or within 30 days of harvest. DO NOT exceed 10 applications per season. DO NOT graze livestock on treated areas.
Envidor 2SC		DO NOT apply within 7 days of harvest. DO NOT apply more than 34 ounces per acre per season. DO NOT apply more than once per year.
Fulfill	--	DO NOT apply more than 4 ounces per acre per application nor more than 8 ounces per acre per season. Allow 7 days between applications. DO NOT apply within 14 days of harvest.
Imidan	0.1	DO NOT apply within 14 days of harvest. DO NOT graze livestock in treated orchard.

Chemical	Tolerance Residue (ppm)	Comments
Intrepid	---	DO NOT apply more than 16 ounces per application or 64 ounces per season per acre. DO NOT harvest within 14 days of application.
Kelthane (Dicofol)	---	DO NOT treat within 7 days of harvest. DO NOT make more than two applications per year nor apply more than 8 pints per acre per year.
Lorsban	0.2	DO NOT make more than five applications per season. DO NOT apply within 28 days of harvest. DO NOT graze livestock in treated orchard.
Mustang Max	0.75	DO NOT apply more than 0.15 pound active ingredient per acre per season. DO NOT graze livestock in orchard or cut treated cover crops for feed. DO NOT apply within 21 days of harvest.
Nuprid 1.6F		DO NOT apply within 7 days of harvest. DO NOT apply more than 28 ounces per acre per season. DO NOT make applications less than 6 days apart.
Orbit	0.1	DO NOT make more than four applications per year. DO NOT apply after shuck split. DO NOT graze livestock in treated orchard. Because of endangered species restrictions, DO NOT use Orbit in the following counties: Colbert, Greene, Jackson, Lamar, Lauderdale, Limestone, Madison, Marshall, Morgan, Pickens, and Sumter.
Penncap-M	---	DO NOT apply when weeds and cover crops are blooming and bees are foraging in areas to be treated. DO NOT make applications at less than 14-day intervals. DO NOT apply more than 64 pints per acre per year. DO NOT apply after shucksplit. DO NOT graze or feed cover crops to livestock within 15 days of application.
Phaser (Endosulfan)	0.2	DO NOT apply after shucksplit. DO NOT graze livestock in treated orchard. This material is EXTREMELY TOXIC to cattle. Phaser is a RESTRICTED USE pesticide. DO NOT make more than two applications per year. DO NOT exceed 3.0 pounds active ingredient per acre per year.
Provado 1.6F	---	DO NOT apply more than a total of 28 fluid ounces per acre per year. DO NOT apply within 7 days of harvest. DO NOT make applications less than 6 days apart.
Quilt		DO NOT apply after shuck split. DO NOT apply more than 122 ounces per acre per season. DO NOT graze livestock in treated areas or cut treated cover crops for feed.
Savey 50DF		DO NOT graze or feed livestock on cover crops growing in treated areas. Do not harvest less than 28 days after last application. Do not apply more than one time per year.
Sevin	1	None.
Sovran	---	DO NOT make more than six applications per season. DO NOT make more than three sequential applications. DO NOT apply Sovran as the final spray of the season. DO NOT apply within 45 days of harvest.
Super Tin (TPTH)	0.05	DO NOT apply after shucks begin to open. DO NOT graze livestock in treated orchard. Super Tin is a RESTRICTED USE pesticide. DO NOT add surfactants, spreader-stickers, or buffers. DO NOT make more than ten treatments per season.
Syllit	0.03	DO NOT apply after shucks begin to open or within 15 days of harvest. DO NOT graze livestock in treated orchards.

Chemical	Tolerance Residue (ppm)	Comments
Temik	0.5	DO NOT make more than two applications per year. DO NOT graze livestock in treated orchard. DO NOT harvest forage or hay from treated areas. Temik is a RESTRICTED USE pesticide.
Topsin M	---	DO NOT apply after shuck split. Always apply Topsin M with another fungicide.
Trimax Pro		DO NOT apply with in 7 days of harvest. DO NOT apply more than 10.1 ounces per acre per season. DO NOT make applications less than 10 days apart.
Vendex	0.5	DO NOT apply within 14 days of harvest. DO NOT apply more than two times per season. DO NOT graze livestock in treated orchard. Vendex is a RESTRICTED USE pesticide.
Warrior	--	DO NOT apply within 14 days of harvest. DO NOT apply more than 0.16 pound active ingredient per acre per year.

WEED CONTROL

Herbicides are recommended for pecan orchards to provide an 8- to 12-foot-wide, weed-free strip between the tree rows. This weed-free strip between rows will reduce weed competition in both the young and the old trees, and it will help increase harvesting efficiency as well as prevent mower damage.

Keep the area between tree rows as a mowed sod, 1 inch or less in height. This sod-herbicide system provides an all-weather roadway for spraying and harvesting equipment and is an effective floor for mechanical harvesting. Also, this system eliminates mechanical disking, which often damages pecan roots and spreads crown gall.

Table 13. Pecan Weed Control

Herbicide Trade Name (Rate/Acre Broadcast)	Herbicide Common Name (Active Herbicide/Acre)	Comments
Preplant Incorporated (PPI)		
PROWL 3.3EC (2.4-4.8 qt.) or PROWL H ₂ O (4-8 pt.)	pendimethalin (2-4 lb.)	Apply preplant or preemergence ONLY to nonbearing trees to control annual grasses and small-seeded broadleaf weeds. Will not control emerged weeds.
TREFLAN TRIFLURALIN TRILIN (1-2 pt.)	trifluralin (0.5-1 lb.)	Before planting trees, apply to soil as a broadcast spray and incorporate into soil within 8 hours. Use lower rate on coarse soils. Controls most annual grasses and many small-seeded broadleaf weeds.
Preemergence (PRE)		
CHATEAU (6-12 oz.)	flumioxazin (0.19-0.38 lb.)	For use in NON-BEARING ORCHARDS only. DO NOT use more than 6 ounces per acre per application on sandy soils. Keep spray off the trunk of trees. Provides residual control of several weeds. May be mixed with Gramoxone, glyphosate, or Rely.
GALLERY 75DF (0.66-1.33 lb.)	isoxaben (0.5-1 lb.)	Apply ONLY to trees that will not bear harvestable fruit within 12 months. May be applied after soil has settled around newly planted trees. Controls several winter annual broadleaf weed species.
GOAL 2XL (2-8 pt.)	oxyfluorfen (0.5-2 lb.)	Apply ONLY to dormant trees. Goal should be applied to the soil and to the base of trees. Controls winter annual weeds. May be tank mixed with Devrinol, Surflan, or Solicam for residual grass control. DO NOT apply after budswell.
KARMEX DF (4 lb.) or DIREX 4L or DIURON 4L (3 qt.)	diuron (3.2 lb.)	Use ONLY where trees have been established 3 years or more. Controls many annual grasses and broadleaf weeds. Apply before weeds emerge, in spring for summer weed control, or in fall for winter weed control. If summer and winter weed control is desired, apply half the recommended rate in spring and half in fall. DO NOT use in areas where tree roots are exposed. If used as an early postemergence treatment, add a surfactant at the rate of 2 quarts per 100 gallons of spray. Best results are obtained on succulent weed seedlings. DO NOT use on sandy or loamy sand soils. DO NOT allow livestock to graze in treated areas. Karmex may be tank mixed with Surflan. See label for appropriate use rate.

Herbicide Trade Name (Rate/Acre Broadcast)	Herbicide Common Name (Active Herbicide/Acre)	Comments
Preemergence (PRE) (cont.)		
PRINCEP CALIBER 90 (2.2-4.4 lb.) or PRINCEP 4L or SIMAZINE 4L (2-4 qt.)	simazine (2-4 lb.)	Apply to orchards established more than 1 year. Controls many annual grasses and broadleaf weeds. Apply before weeds emerge, in spring for summer weed control, or in fall for winter weed control. If summer and winter weed control is desired, apply half the recommended rate in spring and half in fall. Apply to orchard floor and avoid contact with tree foliage or green stems. Will not control established weeds. DO NOT use on sandy or loamy sand soils. DO NOT allow livestock to graze in treated areas. See label for appropriate use rate. Princep may be tank mixed with Surflan or Gramoxone.
SOLICAM 80DF (2.5-5 lb.)	norflurazon (2-4 lb.)	Apply under bearing and non-bearing pecan trees. DO NOT apply until the soil has settled around transplanted trees. Make only one application per year either as a fall postharvest treatment or as an early spring treatment. DO NOT graze treated areas. Solicam can be tank mixed with Gramoxone.
SURFLAN AS (2-6 qt.)	oryzalin (2-6 lb.)	Apply under bearing and non-bearing pecan trees. DO NOT apply to newly transplanted trees until the soil has settled and no cracks are present. Use the low rate for 2 to 4 months of weed control, the medium rate for 6 to 8 months, or the high rate for 8 to 12 months of weed control. Controls many annual grasses and small-seeded broadleaf weeds. DO NOT allow livestock to graze treated areas.
Postemergence (POST)		
AIM EC (1-2 oz.)	carfentrazone (0.016-0.031 lb.)	Apply alone or mixed with other herbicides for foliar control of several broadleaf weeds. Has no grass or soil residual activity. Add non-ionic surfactant at 2 pints per 100 gallons or crop oil concentrate at 8 pints per 100 gallons. Keep spray off of green pecan tissue. No preharvest interval is required.
FUSILADE DX (1 pt.) + Crop Oil Concentrate (2 pt.) or Non-ionic Surfactant (0.5 pt./25 gal. spray mix)	fluazifop-butyl (0.2 lb.) + crop oil concentrate or non-ionic surfactant	Apply as a directed spray using a maximum of 25 gallons of spray solution per acre. Use hollow cone or flat fan nozzles. A non-phytotoxic crop oil concentrate or non-ionic surfactant must be used with this herbicide. Use a crop oil concentrate with Fusilade to control perennial grasses, such as bermudagrass and johnsongrass. Repeat application may be needed if regrowth occurs. Broadleaf weeds and nutsedges (nutgrass) will not be controlled by this herbicide. DO NOT harvest within 30 days of treatment.
GRAMOXONE INTEON (2-4 pt.) or FIRESTORM (1.25-2.5 pt.) + Non-ionic Surfactant (0.5 pt./50 gal. spray mix)	paraquat (0.5-1 lb.) + non-ionic surfactant	One-year-old trees may have green bark and be injured by herbicide contact. DO NOT allow the spray to contact green stems, fruit, or foliage. Controls many annual broadleaf weeds and grasses and top-kills perennials. Apply as a directed spray when weeds and grasses are succulent and new growth is 1 to 6 inches high. Has no residual activity. Also useful as a knock-down chemical on sod middles. Observe safety precautions. DO NOT allow livestock to graze on treated areas. Paraquat is a RESTRICTED USE pesticide.

Herbicide Trade Name (Rate/Acre Broadcast)	Herbicide Common Name (Active Herbicide/Acre)	Comments
Postemergence (POST) (cont.)		
POAST 1.5E (1.5-2.5 pt.) +	sethoxydim (0.25-0.5 lb.) +	Provides control of annual and some perennial grasses. Apply as a directed spray in a maximum of 20 gallons of spray solution per acre. A repeat application may be needed.
Crop Oil Concentrate (2 pt.)	crop oil concentrate	Broadleaf weeds and nutsedge will not be controlled. DO NOT harvest within 15 days after application.
RELY (3-6 qt.)	glufosinate (0.75-1.5 lb.)	Apply under trees of all ages, bearing or non-bearing, for control of annual and perennial weeds and grasses. DO NOT apply within 14 days of harvest. DO NOT allow livestock to graze in treated areas.
ROUNDUP or TOUCHDOWN or GLYPHOSATE (generic forms) +	glyphosate (1-4 lb.) +	Apply under NON-BEARING trees that are more than 2 years old. May be applied to BEARING trees of any age. DO NOT allow spray to contact foliage or green stems of trees. Controls a broad spectrum of annual and perennial weeds and grasses. DO NOT allow livestock to graze in treated areas. See label for specific rates.
Non-ionic Surfactant (1 pt./25 gal. spray mix)	non-ionic surfactant	
SANDEA (0.66-1.33 oz.)	halosulfuron (0.032-0.063 lb.)	Provides postemergence control of nutsedge and several other weeds. Apply as a directed spray under trees established for 1 year or more. Use lower rates on sandy soil. Add non-ionic surfactant at 2 pints per 100 gallons of spray mix. DO NOT apply within 1 day of harvest.
SELECT 2E (6.8 fl.oz.) +	clethodim (0.09-0.125 lb.) +	For control of annual and perennial grasses in NON-BEARING orchards only. Add a crop oil concentrate at 2 pints per 25 gallons of spray mix.
Crop Oil Concentrate	crop oil concentrate	
WEEDAR 64 (3 pt.)	2,4-D amine (1.4 lb.)	Apply to vegetation between DORMANT trees for control of emerged winter annual weeds. DO NOT apply within 2 weeks of budbreak. Clean spray equipment thoroughly after using this product.
Chemical Mowing		
ROUNDUP or TOUCHDOWN or GLYPHOSATE (generic forms)	glyphosate (0.12-0.5 lb.)	Inhibits bahiagrass seedhead formation and suppresses vegetative growth of bahiagrass and bermudagrass. Use the low rate for bahiagrass or for bermudagrass growing under shade. Apply 2 weeks after green-up or after mowing to a height of 3 to 4 inches. DO NOT apply more than twice per season. See label for additional comments.

Table 14. Herbicide Classification by Mode of Action

Mode of Action	Herbicides
AMINO ACID SYNTHESIS INHIBITORS	Rely, Roundup, Touchdown
CELL MEMBRANE DISRUPTORS	Gramoxone
GROWTH REGULATORS	2,4-D
LIPID SYNTHESIS INHIBITORS	Fusilade, Poast
PHOTOSYNTHETIC INHIBITORS	Karmex, Princep, Solicam
ROOT GROWTH INHIBITORS	Devrinol, Surflan

Weed Control section prepared by Michael G. Patterson, *Extension Weed Scientist*, Professor, Agronomy and Soils, Auburn University; William D. Goff, *Extension Horticulturist*, Professor, Horticulture, Auburn University; Monte Nesbitt, *Agricultural Program Associate*, Horticulture, Auburn University; and John W. Everest, former *Extension Weed Scientist*, Professor Emeritus and Visiting Professor, Agronomy and Soils, Auburn University.

Table 15. Estimated Effectiveness of Recommended Herbicide Treatments on Important Weeds Infesting Pecans in Alabama and Properties That May Affect Water Quality¹

WEEDS	HERBICIDES					
	Treflan (PPI)	Chateau (PRE)	Gallery (PRE)	Karmex (PRE)	Princep (PRE)	Solicam (PRE)
Bahiagrass	2	0	0	1	1	4
Bermudagrass	2	0	0	0	0	4
Blackberry	0	2	0	1	1	2
Crabgrass	9	5	0	8	8	8
Florida Pusley	9	8	6	8	9	8
Goosegrass	9	4	0	8	8	8
Lambsquarter	5	9	9	9	8	5
Morningglory	0	8	5	5	7	5
Nutsedge	0	0	0	0	0	7
Pigweed	9	9	9	9	9	9
Prickly Sida	0	8	6	4	9	9
Ragweed	3	9	9	8	8	8
Texas Panicum	9	1	0	4	4	4
Surface-loss Potential	S	M	S	M	M	M
Leaching Potential	S	S	S	M	M	M

continued

¹ Ratings are based on observations of research plots and field use under average weather conditions for several years by weed control workers in Alabama and the South. Leaching and surface-loss potentials are based in part on herbicide chemical characteristics and pesticide behavior models developed by USDA scientists as well as on field experience.

² The surface-loss potential indicates the tendency of the pesticide to move with sediment in runoff.

³ The leaching potential indicates the tendency of the pesticide to move in solution with water and to leach below the root zone.

KEY TO CONTROL RATINGS AND ABBREVIATIONS

Ratings on a scale of 0 to 10: 0 = No control; 10 = 100% control; -- = Information not available.

PPI = Preplant Incorporated; PRE = Preemergence; POST = Postemergence.

S = Small; M = Medium; L = Large.

Table 15. Estimated Effectiveness of Recommended Herbicide Treatments on Important Weeds Infesting Pecans in Alabama and Properties That May Affect Water Quality¹ (cont.)

WEEDS	HERBICIDES						
	Surflan (PRE)	Aim (POST)	Gramoxone (POST)	Fusilade, Poast (POST)	Rely (POST)	Roundup, Touchdown (POST)	Sandea (POST)
Bahiagrass	0	0	3	8	8	8	0
Bermudagrass	0	0	3	8	8	8	0
Blackberry	0	4	3	0	--	6	0
Crabgrass	8	0	7	9	9	9	0
Florida Pusley	8	1	6	0	--	9	--
Goosegrass	8	0	8	9	9	9	0
Lambsquarter	5	8	8	0	8	9	--
Morningglory	0	9	8	0	--	9	4
Nutsedge	0	0	4	0	7	7	8
Pigweed	9	7	9	0	8	9	8
Prickly Sida	0	1	6	0	--	9	--
Ragweed	4	1	8	0	8	9	8
Texas Panicum	7	0	9	9	8	9	0
Surface-loss Potential²	M	S	S	M	S	S	
Leaching Potential³	S	S	S	S	S	S	

¹ Ratings are based on observations of research plots and field use under average weather conditions for several years by weed control workers in Alabama and the South. Leaching and surface-loss potentials are based in part on herbicide chemical characteristics and pesticide behavior models developed by USDA scientists as well as on field experience.

² The surface-loss potential indicates the tendency of the pesticide to move with sediment in runoff.

³ The leaching potential indicates the tendency of the pesticide to move in solution with water and to leach below the root zone.

KEY TO CONTROL RATINGS AND ABBREVIATIONS

Ratings on a scale of 0 to 10: 0 = No control; 10 = 100% control; -- = Information not available.

PPI = Preplant Incorporated; PRE = Preemergence; POST = Postemergence.

S = Small; M = Medium; L = Large.

PECAN MANAGEMENT CHECKLIST

Each year, the pecan producers who get maximum returns from the dollars they invest in pecan growing are those who carry out certain key management practices. Use this maximum return checklist to check up on your pecan management system. If you cannot mark off each of these points for your own operation, you may be missing out on maximum returns.

Test fertility annually and follow recommendations. Get a leaf analysis and soil test in each orchard every year. Poor soil fertility, including deficiency in both major and minor elements, is a severe problem in unmanaged orchards. Maintaining good soil fertility and pH of 6.5 or better is essential for profitable yields year after year.

Scout orchards regularly for problems. Have a trained person check thoroughly at least once a week during the growing season. Some growers hire consultants or scouts while others prefer to check their own orchards. Scouting allows for the proper timing of control measures, helps identify pest problems, and provides the records needed for planning pest control in future years. Scouting can also tell you how effective your applications have been and how complete your spray coverage is. Except for fungicides, automatic applications of pesticides are a poor investment. Select and apply pesticides recommended for the specific pests present. Observe "threshold levels" where they have been established for particular pests.

Irrigate if economically feasible. Timely irrigation increases the average yield and quality of pecans. It provides a measure of insurance against loss during dry years, and it can help ensure that an orchard bears annually. Before installing irrigation, however, study the costs to find out if irrigation is economically justifiable in your orchard.

Maintain orchard sanitation. Remove all the limbs, shucks, old nuts, and excessive ground cover to reduce any insect pest problems, disease incidence, and weed competition. Make it a practice to keep your orchard clean.

Prune and train young trees. Pruning and training is a must for development of strong, well-balanced trees and to ensure a maximum fruiting surface. Older, established trees that present a closed canopy should also be pruned to allow sunlight penetration and to increase fruiting surface. Thinning of trees in older orchards may be needed.

Use sod-strip weed control. Use herbicides to create a 10- to 14-foot-wide weed-free strip within the tree rows. Row middles may be planted in winter annuals or legumes or established in perennial summer grasses. Creation of the weed-

free strip reduces weed competition in both young and old trees and lessens the possibility of cultivation and mower injury to trees.

Do not cultivate under trees. Pecan trees generally have shallow feeder-roots, and cultivation can injure or sever them. If crown gall is present in the orchard, cultivation can spread this disease from tree to tree as the roots are cut.

Keep middles under control. Lush growth of winter annuals during the spring can cause problems. If this situation exists, clip row middles closely as soon as the spray program is started. Keeping row middles controlled during the pecan growing season will reduce weed competition and humidity, help permit good air flow in the orchard, and eliminate breeding areas for some insect pests.

Apply a budbreak fungicide spray. Scab infection of young leaves can begin immediately after budbreak. Apply the first fungicide sprays in time to protect the developing foliage against infection. Early application of fungicide is essential to keep scab incidence low throughout the remainder of the growing season.

Control diseases using a regular spray program. Begin your fungicide spray program at budbreak and maintain a 14- to 21-day schedule throughout the growing season. Early in the season and during humid periods, use the shorter interval for better control. Use the recommended rate of fungicide and at least 10 gallons of spray volume per tree for good coverage.

Don't spread crown gall. When planting new trees, do not use any which have galls or abnormal growths on the roots. Rid the orchard of berry vines, which are a natural host for crown gall, and don't spread crown gall by cultivating or mowing close to trees.

Use beneficials when possible. Based on careful scouting, allow low levels of damaging foliage-feeding pests early in the season in order to help build up a beneficial insect population. These insects can help keep even larger infestations of damaging insects in check later in the season.

Use trapping to detect nut pests. Pests such as the hickory shuckworm and pecan weevil are best detected by traps. Blacklight traps are essential for determining shuckworm populations. Cone emergence traps allow detection of weevil emergence patterns. Time insecticide applications by the findings of such traps.

Maintain orchard pest infestation records. Complete yearly records will help you identify pest hot spots and annual trends in each orchard.

For more information and for specific recommendations, contact your Extension county agent. You can get detailed information applicable to conditions in your area. You can also get cost-and-return budgets and up-to-date publications on pecan production.

ANR-54, Pecan Production

ANR-86, Weed Control For Fruits And Nuts (annual)

ANR-248, Pecan Orchard Floor Management

ANR-260, Pecan Weevil Control

ANR-275, Hickory Shuckworm Control

ANR-F1-F4, Pecan Pest Management Record Forms

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For more information, call your county Extension office. It is listed in your telephone directory under your county's name.

Use pesticides **only** according to the directions on the label. Follow all directions, precautions, and restrictions that are listed. Do not use pesticides on plants that are not listed on the label.

The pesticide rates in this publication are recommended **only** if they are registered with the Environmental Protection Agency or the Alabama Department of Agriculture and Industries. If a registration is changed or cancelled, the rate listed here is no longer recommended. Before you apply **any** pesticide, check with your county Extension agent for the latest information.

Trade names are used **only** to give specific information. The Alabama Cooperative Extension System does not endorse or guarantee any product and does not recommend one product instead of another that might be similar.



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