

COMMERCIAL PECAN INSECT CONTROL (BEARING TREES)

Will Hudson, Extension Entomologist

Orchard Survey Procedures

Insect and mite infestation levels should be estimated at least weekly based on thorough orchard sampling. Sample trees in all segments of each orchard. A good method is to sample every fourth tree in every fourth tree row (about 10% of the trees). Sample each major cultivar represented in the orchard. Sample a minimum of 10 terminals per tree. Check all the compound leaves and the nut clusters on each terminal. Check as high in the tree as possible. Foliar pest counts should be made on compound leaves surrounding the nut clusters. Nut clusters should be inspected carefully for the presence of pests or damage. Hickory shuck-worm and pecan weevil populations should be monitored by survey traps and knockdown sprays or a combination of these methods.

PESTICIDE	AMOUNT PER ACRE	PEST, TIMING AND REMARKS
chlorpyrifos 4E (Lorsban, Chlorphos) Centric 40WG Provado 1.6F Trimax Pro	2 pts. 2.0 to 2.5 ozs. 3.5 ozs. 1.3 to 2.6 ozs.	PHYLLOXERA Treat trees with a recent history of heavy infestation and surrounding trees. Apply at budbreak with the first prepollination spray. Note: Other imidacloprid formulations are available. Read labels carefully to find the proper rate.
Provado 1.6F Trimax Pro	3.5 ozs. 1.3 to 2.6 ozs.	SPITTLEBUGS Spittlebug infestations are easily recognized by the white, frothy masses on terminals or nut clusters. Definite thresholds have not been established. Many generic imidacloprid formulations are available.
chlorpyrifos 4E (Lorsban, Chlorphos) or Belt SC or Intrepid 2F or Spintor 2SC or Dimilin 2L	1 ½ pts. 3 to 4 ozs. 4 to 8 ozs. 4 to 10 ozs. 8-16 ozs.	PECAN NUT CASEBEARER Light infestations causing occasional damage do not require control in normal crop years. The most serious damage usually occurs in mid May. Adult emergence should be monitored with pheromone traps. Place traps in orchards by mid April. Begin sampling for nut casebearer in the first week of May. Pay particular attention to orchards not under a spray program the preceding year and orchards with a recent history of nut casebearer problems. Try to time sprays to stop injury before more than one nut per cluster is infested. Make a second application one week later if infestations are heavy. Additional applications may also be needed for second generation nut casebearers in mid June. Several pyrethroid insecticides, including Ammo, Asana, and Fury are labeled for nut casebearer control. It is suggested that they not be used for control of first generation nut casebearers (in May) to avoid aphid exposure to these materials and to conserve beneficial insect populations. (see Special Considerations section.)
Vendex 50W Savey 50DF Envidor 2SC Acramite 4SC Portal Zeal Desperado Nexter (Pyridaben)	1 lb. 3-6 oz. 14-18 oz. 12-16 ozs. 2 pts. 2-3 oz. 1 to 1.1 gal. 5.2 to 10.67 ozs.	MITES Mites, especially the pecan leaf scorch mite, are normally late season pests. Mite damage appears as brown, scorched areas on the undersides of leaflets. Scorched areas begin at the leaflet midribs then spread out toward leaflet margins. Mites often build up on low limbs in the shaded, interior portions of trees then spread rapidly up and out. For heavy infestations, repeat the application in 5 to 7 days. For best results, Vendex should be applied before mites and damage are heavy. Savey is an ovicide, and should be tank-mixed with an adulticide. Zeal is primarily an ovicide/larvicide.
FOLIAR APPLICATIONS Provado 1.6F pymetrozine (Fulfill) Assail 30SG thiamethoxam (Centric) Trimax Pro	3.5 to 7 fl. oz. 4.0 oz. 2.5 to 9.6 ozs. 2.0 to 2.5 oz. 1.3 to 2.6 ozs.	YELLOW APHIDS Yellow aphids may be present in orchards throughout the growing season. Populations are usually highest in April-May and again in August-September. In early season, do not treat yellow aphids if they are the only insect problem. Rely on beneficial insects to suppress early season populations. In prolonged dry periods, lower, chronic aphid populations may require treatment to prevent the build-up of unacceptable levels of honeydew and sooty mold. WEEKLY SCOUTING IS VERY IMPORTANT IN TIMING APHID SPRAYS, ESPECIALLY IN LATE SEASON. It is suggested that pyrethroid materials (Asana, Ammo, Fury) not be used, alone or in combination, in early-or mid-season applications. Where rate ranges are given, use the lowest effective rate.
SYSTEMIC APPLICATIONS Admire Pro	7.0 to 14.0 fl. oz.	Two Provado applications at 10 - 14 day intervals may be required. Allow 10 or more days between applications, Scout orchards and retreat if necessary. Addition of an organophosphate insecticide to low rate Provado sprays will assist in black aphid control and resistance management. It is also suggested that foliar applications of Provado not be used in orchards receiving a soil application of Admire. Other imidacloprid formulations are available. Read labels carefully to find proper rate. Admire can be applied through a drip irrigation system, as an emitter spot application, or as a shanked-in emitter adjacent application. <u>See label for complete details</u> Apply Admire only to orchards where drip irrigation has been established for at least five years.

COMMERCIAL PECAN INSECT CONTROL (continued)

PESTICIDE	AMOUNT PER ACRE	PEST, TIMING AND REMARKS
SAME INSECTICIDES AS FOR YELLOW APHIDS or Dimethoate 4EC or Imidan 70WP	2/3 pt. 2 lbs.	BLACK PECAN APHID Black pecan aphids may cause damage as early as May but are usually a serious problem only in late season. Damage appears as yellow spots on leaflets. Damaged spots later turn brown and 2 to 4 damaged spots per leaflet can cause leaflet drop. Carefully check all compound leaves on 10 terminals per tree, on at least 10 trees per orchard for the presence of black pecan aphids. Prior to July 1, treat if 25% of terminals have 2 or more black aphids. After July 1, treat if 15% of terminals have more than one black aphid. Concentrate checks on susceptible cultivars such as Schley, Sumner and Gloria Grande. Be sure to check all compound leaves on each terminal examined.
Intrepid 2F or Dimilin 2L or chlorpyrifos 4E (Lorsban, chlorfos) or Belt SC	4 to 8 ozs. 8-16 ozs. 1 to 2 qts. 3 to 4 ozs.	HICKORY SHUCKWORM Shuckworms are active throughout the season but do not cause significant damage until June or later. Prior to shell hardening, larval feeding causes nuts to drop. After shells harden, feeding causes shucks to stick to the shells, reducing quality. If orchards have a history of shuckworm infestation, a spray should be applied in early June. In early August, 2 to 3 additional sprays should be applied. Initiate August sprays at half-shell hardening and repeat at 2 week intervals until shuck split if shuckworm activity continues. Chlorpyrifos and pyrethroids (Asana, Ambush, Mustang, etc.) applied for other pests will also control shuckworm. It is not necessary to spray in August if pecan weevil controls are applied. Please <u>note the Special Considerations section</u> regarding the use of pyrethroid materials.
Carbaryl 80S (Sevin) or Carbaryl 4F (Sevin XLR) Various pyrethroids	3 lbs. 4 to 5 pts.	PECAN WEEVIL Pecan weevil emergence may extend from July into October. Peak emergence is normally between August 10 and September 20. Emergence should be monitored in each infested grove with traps, knockdown sprays or a combination of these methods. Trees known to have a recent history of weevil problems should be selected for monitoring. If excessive nut drop results from pecan weevil feeding punctures before pecan shells begin to harden, spray at once. After pecan shells harden and nuts reach the "dough" or "gel" stage, treat when weevils emerge (especially following rains) and continue at 7 to 10 day intervals until emergence stops. APHID OR MITE POPULATIONS MAY BUILD UP WHERE CARBARYL IS USED. If these pests become a problem, apply aphicides or miticides as previously directed. <u>Note:</u> Several pyrethroids, (Asana, Ammo, Baythroid, Brigade, Mustang Max) as well as Imidan and PennCap-M are labeled for pecan weevil control. If these materials are used for weevils, they can be expected to be most effective where weevil populations are low. They may be adequate to prevent feeding injury from weevils emerging prior to shell hardening but their use could be risky under heavy weevil pressure after nuts reach the gel stage and are subject to weevil oviposition. (See Special Considerations section). Several products are available that combine a pyrethroid insecticide with an aphicide. These products may help suppress aphids while providing weevil control. Brand names include Endigo, Leverage, and others.

COMMERCIAL PECAN INSECT CONTROL (continued)

KERNAL FEEDING HEMIPTERANS

(Stink bugs and Plant bugs)

A complex of true bugs (stink bugs and plant bugs) attack pecan. They may be present in orchards all year but normally cause their most serious injury from late August through September. Prior to shell hardening, feeding injury causes nut drop. After shell hardening, their feeding causes black, bitter spots on the kernels, reducing quality. They can continue to feed, through the hardened shells, until nuts are harvested. The presence and numbers of stink bugs and plant bugs should be noted in surveys throughout the season. Special attention should be paid to the true bugs in late-season orchard surveys. Also, check for stinkbugs and plant bugs in pecan weevil knockdown sprays. It may be necessary to continue knockdown sprays to check for stink bugs even after pecan weevil emergence has ceased. Treat when 1 stink bug is found per 40 terminals OR when 5 or more are found per knockdown spray on a sheet covering 20% of the area under a tree. Sprays for these insects are difficult to time properly because the bugs move in and out of orchards. Close checking is required to detect damaging populations. No materials have consistently given excellent stink bug control, possibly due to the difficulty in timing sprays. **PennCap-M** (2 to 4 pts./A) is labeled for stink bug or plant bug control. The Pyrethroids are also labeled for stink bug control. Please note the pre-harvest use restrictions of the products.

FIRE ANTS

Fire ants have been known to protect pecan aphids by destroying beneficial insects in pecan orchards. Fire ants should be controlled or at least kept out of pecan trees. Lorsban 4E at 2 pts./Acre as a ground spray is labeled for fire ant control.

SCALE INSECTS

Scale populations build slowly, but can reach damaging levels before becoming obvious. Preferred treatment is 1%-2% horticultural oil spray, applied in November-December and again in February. For severe problems an application of Esteem in June may be necessary.

OTHER INSECT PESTS

Pests such as pecan leaf casebearer, leaf miners, walnut caterpillar, fall webworm, pecan budmoth, nut curculio, shoot curculio, Prionus root borers and others may occasionally cause economic injury to pecan. Growers should be able to identify these pests and their damage. Color photographs of all pecan pests and their injury can be found in Pecan Pest Management in the Southeast (Univ. of Ga. Ext. Ser. Misc. Pub. No. 176), in the Pecan Growers Handbook. The publication is available at \$20.00 per copy from: Ag. Business Office, Conner Hall, The University of Georgia, Athens GA 30602. Specific controls for occasional pests not covered in this spray guide can be obtained from your local County Agent.

SPECIAL CONSIDERATIONS

Alternative Formulations. Some pesticides listed in this publication are available in formulations other than the ones listed. If different formulations are used, apply an equivalent amount of actual toxicant per acre.

Pest Resistance and Chemical Use. The aphids and mites which attack pecan have demonstrated the ability to become resistant to insecticides applied for their control. The rate at which this resistance develops depends upon the chemical used, the frequency of use, the duration of use, and the rates used. Aphid and mite exposure to effective materials should be minimized to prolong the effective life of the chemicals. It is suggested that no insecticide be applied until it is absolutely necessary (this can be determined by thorough sampling) and that chemicals be alternated as much as possible. Aphid and mite populations may flare following application of Sevin or pyrethroids. Growers should be alert for this response, and limit applications of these materials to the minimum necessary for weevil or stink bug control.

Supplemental Control Measures. Beneficial insects such as lady beetles and lacewings provide natural assistance in suppressing aphid and mite populations. Beneficials are of particular value in early season. Elimination of unneded early-season insecticide sprays conserves existing populations of beneficial insects and reduces the potential for severe aphid problems later in the season. The planting of leguminous cover crops in tree-row middles promotes the build up and retention of lady beetle populations in orchards. Crimson clover and Hairy vetch appear to be two of the best ground covers. If leguminous ground covers are planted, a herbicide strip should be maintained down each tree row and special attention should be paid to the increased water requirements that are likely to exist. Extraneous plant material resulting from the heavy growth of legumes must be removed or broken down prior to harvest or implementation of a program of row middle vegetation suppression (see Weed Control section).

Alternative Formulations. Some pesticides listed in this publication are available in formulations other than the ones listed. If different formulations are used, apply an equivalent amount of actual toxicant per acre.

Pest Resistance and Chemical Use. The aphids and mites which attack pecan have demonstrated the ability to become resistant to insecticides applied for their control. The rate at which this resistance develops depends upon the chemical used, the frequency of use, the duration of use, and the rates used. Aphid and mite exposure to effective materials should be minimized to prolong the effective life of the chemicals. It is suggested that no insecticide be applied until it is absolutely necessary (this can be determined by thorough sampling) and that chemicals be alternated as much as possible. Aphid and mite populations may flare following application of Sevin or pyrethroids. Growers should be alert for this response, and limit applications of these materials to the minimum necessary for weevil or stink bug control.

Supplemental Control Measures. Beneficial insects such as lady beetles and lacewings provide natural assistance in suppressing aphid and mite populations. Beneficials are of particular value in early season. Elimination of unneded early-season insecticide sprays conserves existing populations of beneficial insects and reduces the potential for severe aphid problems later in the season. The planting of leguminous cover crops in tree-row middles promotes the build up and retention of lady beetle populations in orchards. Crimson clover and Hairy vetch appear to be two of the best ground covers. If leguminous ground covers are planted, a herbicide strip should be maintained down each tree row and special attention should be paid to the increased water requirements that are likely to exist. Extraneous plant material resulting from the heavy growth of legumes must be removed or broken down prior to harvest or implementation of a program of row middle vegetation suppression (see Weed Control section).

COMMERCIAL PECAN INSECT AND DISEASE SPRAY GUIDE (NON-BEARING TREES)

Will Hudson, Extension Entomologist and Jason Brock, Extension Plant Pathologist

FOLIAR SPRAYS

TIME OF APPLICATION	PEST	PESTICIDE	AMOUNT PER ACRE	INSTRUCTIONS AND REMARKS
Bud Break when first buds open.	Foliar disease	Enable 75WP/AgriTin 80WP Co-Pack or Orbit 45WP/Super-Tin 80WP Co-Pack	7.5 oz. 4 oz.	Spray sufficient gallonage for thorough coverage.
	Pecan bud moth	+ chlorpyrifos (Chlorphos, Lorsban)	+ ½ rate 1-2 pts.	
	Hickory shoot curculio	Endosulfan 3EC (Thiodan, Phaser) or chlorpyrifos (Lorsban, chlorphos)	1 qt. 1 ½ -2 pts.	Apply sprays for shoot curculio at bud-break on the earliest cultivars and repeat at 10-14 day intervals.
Cover Sprays three weeks after bud-break spray and every 4-6 weeks as needed.	Foliar disease	Fungicide	See above	Spray sufficient gallonage for thorough coverage.
	Pecan bud moth	+ chlorpyrifos (Chlorphos, Lorsban) or Endosulfan 3EC (Thiodan, Phaser) or Imidan 70WSP or Dimilin 2L or Intrepid 2F	+ 1-2 pts. 1 qt. 1 ½ lb. 8-16 ozs. 4-8 ozs.	

PECAN CHEMICALS: PRE-HARVEST INTERVALS AND OTHER RESTRICTIONS

CHEMICAL	INTERVAL BETWEEN LAST APPLICATION AND HARVEST AND OTHER RESTRICTIONS
Acramite 4SC	14 days PHI - Only 1 spray per year.
Admire	Apply to soil between May 15 and July 15. Apply only to orchards which have been established on trickle irrigation for at least 5 years. Do not apply more than 32 fl. oz. of Admire per acre per season as a soil application. Do not apply more than 0.5 lb. active ingredient of Admire or Provado per acre per season.
Ammo	21 days. Up to 0.8 lbs. a.i./acre per season may be applied prior to shuck split. Do not graze or feed cover crops.
Asana	21 days. Do not feed or graze livestock on treated orchard floors. Do not exceed 0.3 lbs. a.i. per acre per season. Do not mix with fungicides containing triphenyltin hydroxide.
Assail	14 day PHI; do not apply more than 4 times per season, nor more often than every 7 days.
Baythroid	14 days PHI. No more than 2.8 fl. ozs./A/season.
Belt SC	14 day PHI; no more than 4 oz. per 7 days nor more than 12 oz. per season
Carbaryl	14 days. Do not apply more than a total of 15 qts. per season.
Centric	Do not exceed 5.0 oz./acre per season. Allow at least 7 days between applications. Do not apply within 14 days of harvest.
Desperado	7 day PHI; no more than 2.2 gal. per season; no aerial application.
Dicofol	7 days. Applicators must be in enclosed cabs or cockpits.
Di-Syston*	Do not apply more than 3 times per season. Do not apply within 30 days of harvest. Do not graze under treated trees.

Table continued on next page

PECAN CHEMICALS: PRE-HARVEST INTERVALS AND OTHER RESTRICTIONS (continued)

CHEMICAL	INTERVAL BETWEEN LAST APPLICATION AND HARVEST AND OTHER RESTRICTIONS
Dimethoate	21 days. Do not graze livestock in treated groves.
Elast F	Do not apply after shucks open. Do not graze treated areas.
Enable	Do not apply after shuck split or within 28 days of harvest. Do not apply more than 48 ozs. per acre. Do not graze treated areas.
Enable/AgriTin (co-pack) - Orbit/ Super-Tin (co-pack)	Do not apply within 30 days of harvest. Do not graze livestock in treated areas or cut treated areas for feed.
Endosulfan*	Do not apply after shuck split. Do not graze livestock in treated groves. Do not exceed 2 applications per year or 4 qts. per acre per year.
Envidor	Pre-harvest interval is 7 days. Maximum of 1 application per season.
Fury/Mustang	21 days. Do not apply more than 0.3 lbs. a.i./acre/season or after shuck split. Do not graze or cut treated cover crops for feed.
Headline	Do not apply within 14 days of harvest. Do not apply more than 28 fl. oz. per acre per season.
Imidan	14 days. Do not graze livestock in treated groves.
Intrepid	14 days. Do not graze livestock in treated areas or feed cover crops grown in treated areas. Do not apply more than 10 fl. oz./ application or 64 oz. per season.
Kelthane	7 days. Applicators must be in enclosed cabs or cockpits.
Lorsban, Chlorphos	28 days. Do not allow livestock to graze in treated orchards. Make no more than 5 applications per season.
Nexter	7 day PHI; no more than 10.67 oz. per application nor more than 2 applications per season. No aerial applications.
Penncap-M	Do not apply after shuck split. Do not graze within 15 days after application.
Propimax	Do not apply after shuck split. Do not graze livestock in treated areas or cut treated areas for feed. Do not apply more than 32 fl. oz. Per acre per season.
Provado	Do not apply more than 28 fl. oz. of Provado per acre per year. Do not apply more than a total of 0.5 lb. active ingredient of Provado or Admire per acre per season.
Quilt	Do not apply after shuck split or within 45 days of harvest. Do not graze livestock in treated areas or cut treated areas for feed. Do not apply more than 122 fl. oz. per acre per season.
Savey	Do not graze livestock in treated areas. Only one application per season may be made.
Sovran	Do not apply more than 45 days of harvest. Do not apply more than 25.6 fl. oz. per acre per season.
Stratego	Do not apply after shuck split or within 30 days of harvest.. Do not apply more than 30 fl. oz. per acre per season.
Sulfur	No time limitations.
TPTH	Do not use more than 45 ozs. (36 ozs. a.i.) of product per season. Do not apply after shucks begin to open. Do not graze dairy or meat animals in treated groves.
Topsin M	Do not apply after shuck split. Do not graze livestock in treated areas or cut treated areas for feed. Do not apply more than 3 lbs. per acre per season.
Trimax Pro	7 day PHI. Maximum of 10.1 oz./acre allowed per crop season. Allow at least 10 days between applications.
Vendex	14 days. Do not apply more than 2 times per season.
Zeal	Pre-harvest interval is 28 days. Maximum of 1 application per season.

Do not graze livestock in treated groves where prohibited or until grazing restrictions have been met.

WARNING: *Di-Syston, Guthion, and Endosulfan are highly toxic and should be applied **ONLY** by TRAINED OPERATORS.

PECAN DISEASE CONTROL

Jason Brock and Tim Brenneman, Department of Plant Pathology

Prepollination Applications:

every 10-14 days from bud break through nut set

	Chemical & Formulation	FRAC Group	Rate/Acre	Comments
Scab; Downy Spot	propiconazole Orbit Propimax EC Bumper 41.8 EC	3	6 - 8.0 fl. oz.	Additional generic products could also be labeled for use on pecan. Before using any product, check the label.
	fenbuconazole Enable 2F	3	8.0 fl. oz.	For best results, tank mix tebuconazole with a surfactant. Do NOT add a surfactant if mixing with other fungicides.
	tebuconazole Folicur 3.6 F Tebuzole 3.6 F Monsoon Orius 3.6 F Toledo 3.6 F	3	6 - 8.0 fl. oz.	
	propiconazole + azoxystrobin Quilt	3 & 11	14 -27.5 fl. oz.	Use higher rates when disease pressure is severe.
	propiconazole + trifloxystrobin Stratego	3 & 11	10.0 fl. oz.	
	kresoxim-methyl Sovran	11	2.4 - 3.2 fl. oz.	
	pyraclostrobin Headline	11	6.0 - 7.0 fl. oz.	Do not use Elast on Moore, Van Deman, Barton, or Shawnee.
	azoxystrobin Abound	11	6.0-12.0 fl. oz.	Do not use Elast with foliar zinc treatments.
	triphenyltin hydroxide (TPTH) ¹ + FRAC group 3 fungicide	30 3	half rate ² + 4 fl. oz	When conditions are very favorable for scab, use Topsin plus a full rate of TPTH or Elast.
	dodine (Elast 400 F) + FRAC group 3 fungicide	M7	25.0 fl. oz. + half rate	
	dodine (Elast 400 F) + TPTH	M7 30	25.0 fl. oz. + half rate	
	thiophanate methyl ³ + TPTH or + Elast	1 30 M7	1 lb. + ½ rate or 25 fl. oz.	

¹ TPTH is available as Agri Tin, Agri Tin Flowable, Super Tin 80WP, and Super Tin 4L.

² Half rates are 3.75oz. for Agri Tin and Super Tin 80WP; 6 fl. oz for Agri Tin Flowable and Super Tin 4L.

³ Thiophanate methyl is available as Topsin M 70WDG, Topsin M 70WP, and Topsin M WSB, and Topsin M 4.5FL (20 fl. oz. rate is equivalent to 1 lb. of wettable powder).

PECAN DISEASE CONTROL (continued)

Postpollination Applications:

every 10-21 days from nut set to shell hardening.

	Chemical & Formulation	FRAC Code	Rate/Acre	Comments
Scab	triphenyltin hydroxide (TPTH) ¹ Agri Tin Agri Tin Flowable Super Tin 80WP Super Tin 4L	30	7.5 oz. 12 fl. oz. 7.5 oz. 12 fl. oz.	Do not use any surfactant with Elast. When conditions are very favorable for scab, the rate of either mixing partner can be increased. Increasing the rate of FRAC group 3 fungicides will be important if reduced sensitivity is known or suspected.
	dodine Elast 400 F	M7	50 fl. oz.	
	Elast + TPTH	M7 30	25 fl. oz + half rate ²	
	Elast + FRAC group 3 fungicide ³	M7 3	25. fl. oz. + 4 – 6 fl. oz.	
	TPTH + FRAC group 3 fungicide	30 3	half rate + 4 - 6 fl. oz	
	propiconazole + azoxystrobin Quilt	3 & 11	14- 27.5 fl.oz.	
	propiconazole + trifloxystrobin Stratego	3 & 11	10 fl. oz.	
Powdery Mildew	For powdery mildew, the scab fungicide program can be adjusted if needed. The FRAC group 3 fungicides or mixes containing FRAC 3 fungicides are the best options. Combining sulfur (4-6 lbs per acre) with fungicides used for scab control is also an option. Do NOT mix sulfur with Elast.			
Zonate Leaf Spot	For zonate leaf spot, the scab fungicide program can be adjusted if needed. The FRAC group 3 fungicides or mixes containing FRAC 3 fungicides are the best options. Topsin M also provides suppression of Zonate leaf spot.			

¹ TPTH is available as Agri Tin, Agri Tin Flowable, Super Tin 80WP, and Super Tin 4L.

² Half rates are 3.75oz. for Agri Tin and Super Tin 80WP; 6 fl. oz for Agri Tin Flowable and Super Tin 4L.

³ For tebuconazole, use a minimum of 6 fl. oz. in tank mixes for nut scab control.

NOTE: In orchards where any nuts have any amount of scab by mid-June or in orchards where 10% or more of the nuts have any amount of scab by early July, the following measures should be taken.

1. The interval between fungicide sprays should not exceed 14 days until shell hardening.
2. On varieties with a summer growth flush, the spray interval should be closed so that no more than 10 days pass from the onset of the growth flush until a fungicide spray is made.
3. If the 5-day forecast shows the probability for several days of rain, close the interval to have as much acreage as possible treated within 7 days of the storm.

After Shell Hardening: Fungicide coverage for crop protection is necessary to shell hardening. Beginning in early August, monitor for shell hardening and adjust fungicide needs accordingly.

PECAN DISEASE CONTROL (continued)

<p>Foliar diseases: Maintaining leaf health past shell hardening is important. If leaf scab, zonate leaf spot, or another foliar disease is of concern, refer to the previous sections for fungicide options and recommendations. Pay attention to use limitations and fungicide resistance management guidelines. Do not use Topsin in consecutive applications for leaf disease control.</p>				
	Chemical & Formulation	FRAC Code	Rate/Acre	Comments
Phytophthora Shuck and Kernel Rot	A treatment is advised in orchards with a history of this disease (primarily Houston, Peach, and Macon Counties) when wet weather and warm temperatures <86 °F occur between shell hardening and shuck split.			
	TPTH	30	full rate	Do NOT apply KPhite at intervals less than 3 days.
	KPhite	33	1 – 3 qts.	
	FRAC Group 11 fungicides	11	full rate	Use higher rates when disease pressure is high and large, mature trees.
	copper hydroxide	M1	0.75 - 1.75 lbs.	
	Kocide 3000 Kocide 2000		1.5 - 3.0 lbs	

Restrictions and Fungicide Resistance Management Recommendations

- Follow label instructions for proper use of all fungicide products, including safe handling, tank mixing, application method, and resistance management.
- Do not apply more than 32 fl. oz. of propiconazole per acre per season.
- Do not apply more than 32 fl. oz of tebuconazole per acre per season.
- Do not apply more than 1.5 qt. of fenbuconazole per acre per season.
- Do not use more than 45.0 oz of Agri Tin or Super Tin 80WP or 72.0 fl. oz. of Agri Tin Flowable or Super Tin 4L per acre per season.
- Do not apply more than 1.6 lbs (25.6 oz) of kresoxim methyl per acre per season.
- Do not use Elast full season.
- If using a group 3 fungicide alone prepollination, do not use mixes containing a group 3 fungicide postpollination.
- Do not make more than 2 sequential and 3 total applications of group 11 fungicides.
- Do not apply more than 3 lbs. of thiophanate methyl (2.1 lbs. of active ingredient) per acre per season.

COMMERCIAL PECAN WEED CONTROL

Wayne Mitchem, Extension Associate-Weed Science
A. Stanley Culpepper, Extension Agronomist-Weed Science

USE STAGE / HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE			
oryzalin (Surflan) 4 AS (Oryzalin) 4 AS	2 to 6 qt	2 to 6	Use on non-bearing and bearing trees for control of annual grasses and small seeded broadleaf weeds. Use low rate for short-term control (2 to 4 months); high rate for long-term control (8 to 12 months). DO NOT apply to newly transplanted trees until soil has settled and no cracks are present. Apply before annual weeds emerge in the spring or add paraquat, Rely, or glyphosate for control of emerged weeds.
diuron (Karmex or Diuron) 80 DF (Direx) 4 L other brands	2 to 4 lb 1.6 to 3 qt	1.6 to 3.2	Use for control of annual broadleaf weeds and some annual grasses only under trees established in the orchard at least 3 years . Apply in spring before annual weeds emerge; if weeds are present, then include surfactant to improve contact activity. Make a single band or broadcast application as a directed spray. Use low rate on sandy loam soils. DO NOT use on sand, loamy sand, gravelly soils, or on exposed subsoils. DO NOT use on soils with less than 0.5% organic matter. Do not graze treated areas. Add paraquat, Rely, or glyphosate for enhanced control of emerged weeds.
simazine (Princep, Simazine) 90 DF (Princep, Simazine) 4 F	2.2 to 4.4 lb 2.0 to 4.0 qt	2 to 4	Use for control of annual broadleaf weeds and some annual grasses only under trees established for at least 2 years . Provides good control of annual ryegrass. Use low rates on sandy soils. DO NOT apply to gravelly, sand, or loamy sand soils. DO NOT apply when nuts are on the ground. Do not graze treated areas. Add paraquat, Rely, or glyphosate for control of emerged weeds.
oryzalin (Surflan) 4 AS (Oryzalin) 4 AS + simazine (Princep, Simazine) 80 W 90 DG 4 L	2 to 4 qt + 2.5 to 5.0 lb 2.2 to 4.4 lb 2.0 to 4.0 qt	2 to 4 + 2 to 4	Use for broad spectrum annual grass and broadleaf weed control. Provides good control of annual ryegrass. Paraquat, Rely, or glyphosate may be used with this tank mix to enhance control of emerged weeds. See remarks and precautions for each product.
norflurazon (Solicam) 80 DF + diuron (Karmex) 80 DF (Direx) 4 L	2.5 to 5.0 lb + 2 to 3.8 lb 1.6 to 3 qt	2 to 4 + 1.6 to 3.0	Use for broad spectrum annual grass and broad leaf weed control only under trees established in the orchard for at least 3 years. Apply in the spring before annual weeds emerge. See remarks and precautions for each product.
pendimethalin (Prowl H O) 4 EC	2 to 6 qt	2 to 6	Control of annual grasses and broadleaf weeds such as pigweeds. Most effective when adequate rainfall or irrigation is received within 7 days after application. Do not apply to newly transplanted trees until ground has settled around roots. Do not apply within 60 days of harvest. Sequential applications may be used so long as total use rate does not exceed 6 qt./A and there is 30 days between applications.
norflurazon (Solicam) 80 DF	2.5 to 5 lb	2 to 4	Use for control of annual grasses, broadleaf weeds, and suppression of some perennials under bearing, non-bearing, or newly set trees. Apply to newly planted trees only after soil has settled around roots, at least 6 months after planting. Avoid contact with roots. Apply in the fall or early spring--fall applications control a broader weed spectrum than spring applications. Do not apply when nuts are on the ground at harvest. Use low rate on coarse-textured soils, higher rates on fine-textured soils. Make only 1 application per year. DO NOT graze treated areas. May tank mix with simazine or diuron for broader spectrum weed control. Add paraquat, Rely, or glyphosate for control of emerged weeds. Do not apply within 60 days of harvest.

COMMERCIAL PECAN WEED CONTROL (continued)

USE STAGE / HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE (continued)			
flumioxazin (Chateau) 51WDG	6 to 12 ozs.	0.19 to 0.38	DO NOT apply more than 6 ozs./A per application to soils having a sand and/or gravel content > 80%. Tree established less than one year must be shielded with a grow tube or waxed container. DO NOT apply second application within 30 days of initial application. Once trees break dormancy apply with paraquat or Rely for non-selective postemergence control. Must use shielded application equipment if using in non-dormant pecan trees. Pecans has a 60 day PHI.
POSTEMERGENCE			
2,4-D amine (Various generic formulation) 3.8 SL	2 to 3 pt	1 to 1.4	DO NOT apply more than twice a year or within 60 days of harvest. Trees must be at least 1 year old. Do not allow spray to drift onto or contact foliage, fruit, stems, or trunks of trees. DO NOT apply to bare ground. DO NOT apply on light, sandy soils. Past research has shown concerns of injury when applying 2,4-D on sandy soils, immediately before a large rain and during early bud or leaf break. Extreme caution must be taken to avoid off target movement of 2,4-D. Certain crops, like cotton and vegetables, can be severely injured by 2,4-D drift. Some formulations may limit use rate 2 pt/A. See product label for details.
bentazon (Basagran) 4 SL	1.5 to 2 pt	0.75 to 1.0	For use in NON-BEARING pecans only. Basagran will provide POST control of certain broadleaf weeds and yellow nutsedge. For yellow nutsedge control apply 2 pts to plants 6-8" tall. A second application 7-10 days later may be necessary. Include crop oil concentrate at a rate of 2 pt/A. Apply in spray volume of 20 to 30 gal/A.
fluzifop (Fusilade DX) 2 EC 2 lb/gal	8 to 24 fl oz	0.125 to 0.38	Use for control of annual and perennial grasses under bearing or non-bearing trees. Sequential applications will be necessary for control of perennial grass weeds like bermudagrass and johnsongrass. Low spray volumes (10 GPA) generally improve control. Add crop oil concentrate (1.0 qt/A). Make application to johnsongrass-12 to 18 in. tall; bermudagrass-3 in. tall or with 4 to 8 in. runners; annual grasses-2 to 8 in. tall. Does not control nut sedge(s). Do not apply when harvestable nuts are on the ground. Do not graze treated area. Do not apply within 30 days of harvest.
sethoxydim (Poast) 1.5 EC 1.5 lb/gal	1.0 to 2.5 pt	0.3 to 0.5	Use for control of annual and perennial grasses. Sequential applications will be necessary for control of perennial grass weeds like bermudagrass and johnsongrass. Low spray volumes (10 GPA) generally improve control. Add crop oil concentrate (1.0 qt/A). Use low rate on annual grasses up to 6 in. tall; higher rates on larger annual grasses and perennial grasses. Does not control nutsedge(s). Do not harvest within 15 days of application.
clethodim (Select) 2.0 EC (Arrow) 2EC (Intensity) 2EC 2 lb/gal (Select Max) 1 lb/gal (Intensity One) 1 lb/gal	6 to 8 fl oz 12 to 16 oz.		Use for control of annual and perennial grasses in NON-BEARING trees that will not be harvested within 1 year of application. Use higher rates and sequential applications for perennial grasses. Add a non-ionic surfactant containing at least 80% active ingredient at a rate of 1 qt/100 gal of spray solution (0.25% v/v). Make application to johnsongrass-12 to 18 in. tall; bermudagrass-3 in. tall or with 4 to 8 in. runners; annual grasses-2 to 8 in. tall. Does not control nutsedge(s).
Glyphisate + carfentrazone (Rage)	20 to 99 oz.	0.78 to 3.8	Apply as directed spray for non-selective postemergence weed control. Do not apply within 3 days of harvest. Application should be made using hooded or shielded application equipment. Use in combination with a non-ionic surfactant (1 qt./100 gal. of spray solution). The addition of ammonium sulfate at 2 to 4 lb. per acre will enhance herbicide activity.

COMMERCIAL PECAN WEED CONTROL (continued)

USE STAGE / HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE (continued)			
halosulfuron (Sandea) 75 WDG	0.67 to 1.3 3 oz	0.032 to 0.063	For control of nutsedge, pigweed, radish, and cocklebur. Apply as directed spray under trees established for at least one year. Avoid contact of spray with trunk, stem, roots, or tree foliage. May apply up to 2 applications. Do not apply within 1 day of harvest. See label for rate restrictions related to soil texture.
paraquat (Firestorm) 3 SL 3 lb/gal (Gramoxone Inteon) 2 lb/gal	1.75 to 2.7 pt 2 to 4 pt	0.65 to 1	Use for broad spectrum, contact control of emerged weeds. Apply as a directed spray in at least 20 gallons of water with 1 to 2 pt surfactant/100 gal of spray mix or 1% crop oil concentrate (1 gal per 100 gal spray mix). Apply when annual weeds are succulent and 1 to 6 in. tall. <u>DO NOT</u> allow spray drift to contact foliage or green bark of trees since severe damage may occur. <u>DO NOT</u> allow animals to graze on treated areas. May be tank mixed with certain preemergence herbicides for effective residual weed control. <u>DO NOT</u> apply when nuts are on the ground.
glufosinate (Rely 200) 1.67 lb/gal	2 to 3 qt	0.75 to 1.5	Use for broad spectrum control of emerged weeds and grasses, both annuals and perennials. Apply as a directed spray in high spray volumes on non-bearing and bearing trees. Possesses contact and limited systemic activity, but does well on wild brambles and perennial grasses. Does not have soil residual activity. <u>DO NOT</u> contact foliage or green bark.
glyphosate acid (numerous brands) 4 SL Roundup Weather Max 5.5 SL	1 to 2 qt 11 to 46 fl oz	1 to 2	Use for broad spectrum control of emerged weeds, both annuals and perennials. Apply as a directed spray on bearing and non-bearing trees. <u>DO NOT</u> allow spray to contact foliage, suckers, or green bark of trees. Use low rate for control of annual weeds less than 12 in. tall. Refer to product label for rates to control specific perennial weeds. Repeat applications may be made. Some glyphosate formulations require the addition of an adjuvant. Do not allow glyphosate to contact bark or leaves. <u>Try to avoid applications in late summer and fall.</u> Trees are more sensitive to glyphosate during that time. Allow at least 3 days between last application and harvest.
Carfentrazone (Aim) 2 lb/gal	0.5 to 2.0 oz.	0.008 to 0.031	Apply alone or tank mix with other herbicides for postemergence control of broadleaf weeds including pigweed, morningglory, lambsquarters and prickly lettuce. Do not allow Aim to contact desirable foliage, flowers, or fruit. Contact with fruit will result in spotting. Do not apply within 3 days of harvest. Best results obtained when applied to weeds in the 2 to 3 leaf stage. Apply in combination with a non-ionic surfactant (1 qt./100 gal of spray solution) or crop oil concentrate (1 gal/100 gal of spray solution).
ROW MIDDLE VEGETATION SUPPRESSION			
glyphosate acid (numerous brands) 4 SL Roundup Weather Max 5.5 SL	2 to 16 fl oz 1.3 to 5.85	0.06 to 0.5 0.06 to 0.25	Use for vegetative suppression in row middles. Apply 1 to 2 weeks after full green-up of bahiagrass or bermudagrass, or after grass has been mowed to a uniform height of 3 to 4 in. Rates should vary depending on vigor of vegetative growth and canopy of the grove, with the higher rates for more vigorous grass stands where less shade occurs. Low spray volumes (10 GPA) improve control. See respective labels for surfactant requirements. Sequential applications can be made to maintain growth suppression and prepare the orchard floor for mechanical harvest. Allow a minimum of 21 days between the last application and harvest.

FOLIAR ZINC SPRAYS FOR BEARING PECAN TREES

Lenny Wells, Extension Horticulturist

Do not apply foliar zinc unless there is a history of zinc deficiency in the orchard or if leaf analysis suggests a need.

TIME OF APPLICATION	MATERIAL	AMOUNT PER 100 GALLONS	INSTRUCTIONS AND REMARKS
All fungicide (scab) sprays through mid-May	Zinc Sulfate + Urea (feed grade) or Potassium Nitrate or Formulated Zn sprays (NZN-NuZinc Tracite 10% and many other trade names)	2 lbs. 4 lbs. FOLLOW LABEL DIRECTIONS	Do not concentrate. Use only at the dilute rate. Zinc compatible with pesticides recommended on pecans.
First Cover Spray	Same as above		

FOLIAR ZINC SPRAYS FOR NON-BEARING PECAN TREES

TIME OF APPLICATION	MATERIAL	AMOUNT PER 100 GALLONS	INSTRUCTIONS AND REMARKS
All pesticide sprays (scab and insects) through mid- August	Zinc Sulfate + Urea (feed grade) or Potassium Nitrate or Formulated Zn sprays (NZN-NuZinc Tracite 10% and many other trade names)	2 lbs. + 4 lbs. FOLLOW LABEL DIRECTIONS	Do not concentrate. Use only at the dilute rate. Zinc compatible with pesticide recommended on pecans.

FOLIAR NICKEL SPRAYS FOR BEARING AND NON-BEARING PECAN TREES

TIME OF APPLICATION	MATERIAL	AMOUNT PER 100 GALLONS	INSTRUCTIONS AND REMARKS
Make application 10-24 days after bud break. Followed by a second application in mid-July.	Nickel Lignosulfonate (Nickel Plus) (6% Ni)	1 - 1.5 pts. (April) 1.5 - 2 pt s. (July)	Can be tank-mixed with all fungicides, insecticides, nutrients, etc., including zinc. It is not necessary to add urea, which is already present.
For trees with visible mouse ear symptoms, or for newly transplanted trees, especially on sandy sites, or in orchards with a history of high zinc use, make a third application in early October before leaf fall.			Symptoms will be corrected 14-21 days after spring application, therefore all fall application ensures adequate levels of nickel in the plant tissue at bud- break. Research suggests that the lignosulfonate solution poses a lower risk for orchard workers and environmental safety than the metallic salt solution.
Make 1 st application at parachute stage and 2nd application 6 weeks later.	Nickel Sulfate (10% Ni)	1 pt.	

All foliar micro-nutrient applications should be made only on an "as-needed" basis as determined by leaf tissue analysis and/or visual symptoms.

FOLIAR BORON APPLICATION FOR BEARING PECAN TREES

TIME OF APPLICATION	MATERIAL	AMOUNT PER 100 GALLONS	INSTRUCTIONS AND REMARKS
Begin Boron applications with 2nd Prepollination spray. Make 3 applications.	Solubur (20.5%)	1/16 lb. of actual Boron	Do not concentrate. Do not apply more than 1 lb. of total Boron per season.
	Boron Plus (10% B)	1 pt.	When mixing Boron with imidacloprid, check pH of the solution and add an acidifying agent when necessary to bring pH below 7.5.
	Top Side Liquid Boron (6%)	1 pt.	