UGA extension

2017 Commercial Pecan Spray Guide

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ONLINE RESOURCES

http://blog.extension.uga.edu/pecan/
www.caes.uga.edu/commodities/fruits/pecan/
http://wiki.bugwood.org/Pecan/Georgia

www.ent.uga.edu/pest-management/

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 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 shuckworm and pecan weevil populations should be monitored by survey traps and knockdown sprays or a combination of these methods.

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS
Phylloxera	*chlorpyrifos* 4E Lorsban, Chlorphos	1B	2 pt	24 H/ –	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.
	Centric 40WG	4A	2-2.5 oz	12 H/ –	
	Provado 1.6F	4A	3.5 oz	12 H/ –	
	Trimax Pro	4A	1.3-2.6 oz	12 H/ –	
Spittlebugs	*imidacloprid* Trimax, Provado, many generics	4A	See label *Several formulations are available.*	12 H/ –	Spittlebug infestations are easily recognized by the white, frothy masses on terminals or nut clusters. Definite thresholds have not been established and treatment is seldom needed. Many generic imidacloprid formulations are available.
Pecan Nut Casebearer	*chlorpyrifos* 4E Lorsban, Chlorphos	1B	1.5 pt	24 H/ –	Light infestations causing occasional damage do not require control in most 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. It is recommended that broad-spectrum contact insecticides, such as chlorpyrifos and the pyrethroids, not be used in early- or mid-season to conserve beneficial insect populations. (See Special Considerations section.)
	Intrepid 2F	18	4-8 oz	4 H/ –	
	Spintor 2SC	5	4-10 oz	4 H/ –	
	Dimilin 2L	15	8-16 oz	12 H/ –	
	clothianadin Belay	4A	3-6 oz	12 H/ –	
	methoxyfenozide + *spinetoram* Intrepid Edge		4-6.4 oz		
	tolfenpyrad Apta		17-27 oz		**DO NOT** apply more than 1 application. No more than 27 oz/A/season.

COMMERCIAL PECAN INSECT CONTROL

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS
Mites	*abamectin* Agri-Mek SC and others	6	2.25-4.25 oz	12 H/ –	A non-ionic surfactant or horticultural oil MUST be added to the tank.
	Acramite 4SC	Unclassified	12-16 oz	12 H/ –	Mites, especially the pecan leaf scorch mite, are normally late season pests. Mite damage appears as bronzed, 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 -7 days. Savey is an ovicide and should be tank-mixed with an adulticide. Zeal is primarily an ovicide/larvicide.
	Envidor 2SC	23	14-18 oz	12 H/ –	
	Portal	21A	2 pt	12 H/ –	
	pyridaben Nexter	21	5.2-10.67 oz	24 H/ –	
	Savey 50DF	10A	3-6 oz	12 H/ –	
	Zeal	10B	2-3 oz	12 H/ –	
Yellow Aphids	**FOLIAR APPLICATIONS**				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. Rotate among classes of insecticides between treatments to avoid resistance development. It is suggested that pyrethroid materials (cypermethrin, bifenthrin, etc.) not be used, alone or in combination, in early- or mid-season applications. Many generic formulations of imidacloprid are available. Read label carefully for recommended rate. Imidacloprid alone may not control yellow and black-margined aphids. Admire can be applied through a drip irrigation system, as an emitter spot application, or as a shanked-in emitter adjacent application. See label for complete details. Apply Admire only to orchards where drip irrigation has been established for at least 5 years. DO NOT apply more than 1 application of Apta, no more than 27 oz/A/season.
	Assail 30SG	4A	2.5-9.6 oz	12 H/ –	
	clothianidin Belay	4A	3-6 fl oz	12 H/ –	
	flonicamid Beleaf, Carbine	9C	2-2.8 oz	12 H/ –	
	flupyradifurone Sivanto 200 SL	4D	7.0-10.5 oz	4 H/ 7 D	
	imidacloprid Provado, many generics	4A	See label	12 H/ –	
	pymetrozine Fulfill	9B	4 oz	12 H/ –	
	pyridaben Nexter	21	5.2-10.67 oz	24 H/ –	
	sulfoxaflor Closer	4C	1.5-2.75 oz	12 H/ 7 D	
	thiamethoxam Centric	4A	2-2.5 oz	12 H/ –	
	tolfenpyrad Apta	21A	17-27 oz	12 H/ –	
	SYSTEMIC APPLICATIONS				
	Admire Pro	4A	7-14 fl oz	12 H/ –	

COMMERCIAL PECAN INSECT CONTROL

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS
Black Pecan Aphid	SAME INSECTICIDES AS FOR YELLOW APHIDS or *chlorpyrifos* Lorsban, generics	1B	Check label	24 H/ –	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 2-4 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 and nymph clusters are found. Concentrate checks on susceptible cultivars such as Schley, Sumner and Gloria Grande. Be sure to check all compound leaves on each terminal examined.
Hickory Shuckworm	*chlorpyrifos* 4E Lorsban, Chlorfos	1B	1-14 pt	24 H/ –	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, 2-3 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 note the Special Considerations section regarding the use of pyrethroid materials. **DO NOT** apply more than 1 application, no more than 27 oz/A/season.
	clothianadin Belay	4A	3-6 oz	12 H/ –	
	Dimilin 2L	15	8-16 oz	12 H/ –	
	Intrepid 2F	18	4-8 oz	4 H/ –	
	methoxyfenozide + *spinetoram* Intrepid Edge	5 + 18	4-6.4 oz	4 H/ –	
	tolfenpyrad Apta	21A	17-27 oz	12 H/ –	
Pecan Weevil	Carbaryl 80S Sevin	1A	3 lb	24 H/ –	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 7-10 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. **NOTE:** Several pyrethroids, (Asana, Ammo, Baythroid, Brigade, Mustang Max) as well as Imidan 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.
	Carbaryl 4F Sevin XLR Various pyrethroids	1A	4-5 qt	24 H/ –	

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 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. **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. The pyrethroids are 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/A as a ground spray is labeled for fire ant control. Best approach is probably applying an ant bait in late spring.

SCALE INSECTS

Scale populations build slowly, but can reach damaging levels before becoming obvious. Examine fallen limbs carefully during the season for scale presence. 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 the Southern Pecan Growers Handbook and online from the UGA Extension pecan team (Google search "ugapecans"). The publication is available at $30 per copy. For ordering information, visit: http://extension.uga.edu/publications/for-sale.cfm.

Specific controls for occasional pests not covered in this spray guide can be obtained from your local county Extension 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 on 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. Resistance to neonicotinyl insecticides has developed in some areas for both yellow- and black-margined pecan aphids. This class of insecticides includes imidacloprid, thiamethoxam, acetamiprid, and clothianidin. These materials no longer provide adequate control of resistant populations. 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 unneeded 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 Entomology,
Jason Brock and Tim Brenneman, Department of Plant Pathology

FOLIAR SPRAYS

TIME OF APPLICATION	PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	INSTRUCTIONS AND REMARKS
Bud Break When first buds open.	Foliar disease	Fungicide + *chlorpyrifos* Chlorphos, Lorsban	1B	+ half rate 1-2 pt 4-8 oz	24 H/ –	Spray sufficient gallonage for thorough coverage. For fungicide options, refer to the Prepollination section for Pecan Disease Control.
	Pecan bud moth	Intrepid 2F	18	3-4 oz	4 H/ –	
		methoxyfenozide + *spinetoram* Intrepid Edge	5 & 18	4-6.4 oz	4 H/ –	
	Hickory shoot curculio	*chlorpyrifos* Lorsban, Chlorphos, etc.	1B	1.5 -2 pt	24 H/ –	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 + *chlorpyrifos* Chlorphos, Lorsban	1B	See above + 1-2 pt	24 H/ –	Spray sufficient gallonage for thorough coverage.
	Pecan bud moth	*chlorpyrifos* Chlorphos, Lorsban, etc.	1B	1.5 -2 pt	24 H/ –	
		Dimilin 2L		8-16 oz		
		Imidan 70WSP		1.5 lb		
		Intrepid 2F		4-8 oz		

PECAN CHEMICALS: PRE-HARVEST INTERVALS AND OTHER RESTRICTIONS

CHEMICAL	MOA	REI/PHI (Hours or Days)	TIMING AND REMARKS
Acramite 4 SC	Undetermined	12 H/ 14 D	Only 1 spray per year.
Admire	4A	12 H/ –	Apply to soil between May 15 and July 15. Apply only to orchards that 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 ai of Admire or Provado/A/season.
Ammo		– / 21 D	Up to 0.8 lb ai/A/season may be applied prior to shuck split. **DO NOT** graze or feed cover crops.
Asana		– / 21 D	**DO NOT** feed or graze livestock on treated orchard floors. **DO NOT** exceed 0.3 lb ai/A/season. **DO NOT** mix with fungicides containing triphenyltin hydroxide.
Assail	4A	12 H/ 14 D	**DO NOT** apply more than 4 times per season, nor more often than every 7 days.
Baythroid		– / 14 D	No more than 2.8 fl oz/A/season.
Belay	4A	12 H/ 21 D	No more than 12 oz/season. **DO NOT** graze.
Carbaryl	1A	24 H/ 14 D	**DO NOT** apply more than a total of 15 qt/season.
Centric	4A	12 H/ 14 D	**DO NOT** exceed 5 oz/A/season. Allow at least 7 days between applications.
Closer		– / 7 D	No more than 4 applications per season, and no more than 2 consecutive applications.
Desperado		– / 7 D	No more than 2.2 gal/season; no aerial application.
Dimethoate		– / 21 D	**DO NOT** graze livestock in treated groves.
Elast F			**DO NOT** apply after shucks open. **DO NOT** graze treated areas.
Enable		– / 28 D	**DO NOT** apply after shuck split. **DO NOT** apply more than 48 oz/A. **DO NOT** graze treated areas.
Endosulfan			**DO NOT** apply after shuck split. **DO NOT** graze livestock in treated groves. **DO NOT** exceed 2 applications per year or 4 qt/A/year.
Envidor	23	12 H/ 7 D	Maximum of 1 application per season.
Fury/Mustang		– / 21 D	**DO NOT** apply more than 0.3 lb ai/A/season or after shuck split. **DO NOT** graze or cut treated cover crops for feed.
Headline		– / 14 D	**DO NOT** apply more than 28 fl oz/A/season.

PECAN CHEMICALS: PRE-HARVEST INTERVALS AND OTHER RESTRICTIONS

CHEMICAL	MOA	REI/PHI (Hours or Days)	TIMING AND REMARKS
Imidan		3 D/ 14 D	**DO NOT** graze livestock in treated groves.
Intrepid	18	18/ 14 D	**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/season.
Kelthane		– / 7 D	Applicators must be in enclosed cabs or cockpits.
Lorsban, Chlorphos	1B	24 H/ 28 D	**DO NOT** allow livestock to graze in treated orchards. Make no more than 5 applications per season.
Nexter	21A	24 H/ 7 D	No more than 10.67 oz/application nor more than 2 applications per season. No aerial applications.
Portal	21A	12 H/ 14 D	No more than one application per season.
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/A/season.
Provado	4A	12 H/ –	**DO NOT** apply more than 28 fl oz of Provado/A/year. **DO NOT** apply more than a total of 0.5 lb ai of Provado or Admire/A/season.
Quilt		– / 45 D	**DO NOT** apply after shuck split. **DO NOT** graze livestock in treated areas or cut treated areas for feed. **DO NOT** apply more than 122 fl oz/A/season.
Savey	10A	12 H/ –	**DO NOT** graze livestock in treated areas. Only one application per season may be made.
Sovran		– / 45 D	**DO NOT** apply more than 25.6 fl oz/A/season.
Stratego		– / 30 D	**DO NOT** apply after shuck split. **DO NOT** apply more than 30 fl oz/A/season.
Sulfur			No time limitations.
TPTH			**DO NOT** use more than 45 oz (36 oz ai) 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 lb/A/season.
Trimax Pro	4A	12 H/ 7 D	Maximum of 10.1 oz/A allowed per crop season. Allow at least 10 days between applications.
Zeal	10B	12 H/ 28 D	Maximum of 1 application per season.

****DO NOT** graze livestock in treated groves where prohibited or until grazing restrictions have been met.

PECAN DISEASE CONTROL

Jason Brock and Tim Brenneman, Department of Plant Pathology

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
PREPOLLINATION APPLICATIONS: Every 10-14 Days From Bud Break Through Nut Set					
Scab; Downy Spot	*azoxystrobin* Abound Azaka	11	6-12 fl oz	4 H/ 45 D	
	difenoconazole + azoxystrobin Quadris Top	3 + 11	10-14 fl oz	12 H/ 45 D	
	dodine Elast 400F + FRAC group 3 fungicide	U12 + 3	25 fl oz + half rate	48 H/ Do not apply after shuck split	DO NOT use Elast on Moore, Van Deman, Barton, or Shawnee.
	dodine Elast 400F + TPTH	U12 + 30	25 fl oz + half rate	48 H/ Do not apply after shuck split or within 30 D of harvest	DO NOT use any surfactant with Elast. DO NOT use Elast with foliar zinc treatments.
	fenbuconazole Enable 2F	3	8 fl oz	12 H/ Do not apply after shuck split or within 28 D of harvest	
	kresoxim-methyl Sovran	11	2.4-3.2 fl oz	12 H/ 45 D	
	metconazole Quash	3	2.5-3.5 oz/A	12 H/ 25 D	DO NOT make more than 4 applications per season.
	phosphorous acid Phostrol ProPhyt FungiPhite Reliant	33	2-5 pt 2-3 pt 2-3 pt 4 pt	4 H/ –	For best control apply in 100 gpa by ground. DO NOT apply in consecutive applications. The phosphite (phosphorous acid-based) fungicides listed are EPA approved and considered to be very safe products. However, there is currently an unresolved issue regarding potential residues of these products in tree nuts exported to the EU. This affects only nuts exported to the EU, but growers who know their crop is going to that market may want to consider not using phosphite fungicides until this issue is resolved. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season.
	phosphorous acid + tebuconazole Viathon	33 + 3	2-2.5 pt	12 H/ 0 D	The phosphite (phosphorous acid-based) fungicides listed are EPA approved and considered to be very safe products. However, there is currently an unresolved issue regarding potential residues of these products in tree nuts exported to the EU. This affects only nuts exported to the EU, but growers who know their crop is going to that market may want to consider not using phosphite fungicides until this issue is resolved. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season.

PECAN DISEASE CONTROL

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
PREPOLLINATION APPLICATIONS: Every 10-14 Days From Bud Break Through Nut Set					
Scab; Downy Spot *(continued)*	*propiconazole* Orbit Propimax EC Bumper 41.8EC	3	6-8 fl oz	12 H/ Do not apply after shuck split	Additional generic products could also be labeled for use on pecan. Before using any product, check the label.
	propiconazole + azoxystrobin Quilt Quilt Xcel	3 + 11	14-27.5 fl oz 14-21 fl oz	12 H/ Do not apply after shuck split or within 45 D of harvest	Use higher rates when disease pressure is severe.
	pyraclostrobin Headline	11	6-7 fl oz	12 H/ 14 D	
	tebuconazole Folicur 3.6F Tebuzole 3.6F Monsoon Orius 3.6F Toledo 3.6F	3	6-8 fl oz	12 H/ Do not apply after shuck split	For best results, tank mix tebuconazole with a surfactant. DO NOT add a surfactant if mixing with other fungicides.
	tebuconazole + azoxystrobin Custodia	3 + 11	8.6-17.2	12 H/ 45 D	
	tebuconazole + trifloxystrobin Absolute	3 + 11	5-7.67 fl oz	12 H/ Do not apply after shuck split or within 30 D of harvest	
	tetraconazole + triphenyltin hydroxide Minerva Duo	3 + 30	16 oz	48 H/ 30 D	Do not make more than 5 applications per season.
	thiophanate methyl[3] (Topsin M) + TPTH or + Elast	1 30 U12	1 lb + half rate or + 25 fl oz	3 D/ Do not apply after shuck split	When conditions are very favorable for scab, use Topsin plus a full rate of TPTH or Elast.
	triphenyltin hydroxide (TPTH)[1] + FRAC group 3 fungicide	30 + 3	half rate[2] + 4 fl oz	48 H/ 30 D	
Anthracnose	Anthracnose is a disease with a long latent period; symptom expression occurs many weeks after infection. Fungicides used for control of scab have been effective in suppressing anthracnose.				
POSTPOLLINATION APPLICATIONS: Every 10-21 Days From Nut Set To Shell Hardening					
Scab	*difenoconazole + azoxystrobin* Quadris Top	3 + 11	10-14 fl oz	2 H/ 45 D	
	dodine Elast 400F	U12	50 fl oz	48 H/ Do not apply after shuck split	
	dodine Elast 400F + FRAC group 3 fungicide[3]	U12 3	25 fl oz + 4-6 fl oz	48 H/ Do not apply after shuck split	For any tank mix combination of Elast, TPTH, or a group 3 fungicide, the rates provided are the lowest recommended and will provide excellent control of scab under most conditions. When disease pressure is elevated, the rate of either mixing partner can be increased.

PECAN DISEASE CONTROL

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
POSTPOLLINATION APPLICATIONS: Every 10-21 Days From Nut Set To Shell Hardening					
Scab *(continued)*	*dodine* Elast 400F + TPTH	 U12 30	 25 fl oz + half rate[2]	48 H/ Do not apply after shuck split	DO NOT use any surfactant with Elast.
	phosphorous acid Phostrol ProPhyt Viathon FungiPhite Reliant	33	 2-5 pt 2-3 pt 2 pt 2-3 pt 4 pt	4 H/ –	For best control, apply in 100 gpa by ground. DO NOT apply in consecutive applications. The phosphite (phosphorous acid-based) fungicides listed are EPA approved and considered to be very safe products. However, there is currently an unresolved issue regarding potential residues of these products in tree nuts exported to the EU. This affects only nuts exported to the EU, but growers who know their crop is going to that market may want to consider not using phosphite fungicides until this issue is resolved. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season. Use the highest labeled rate; tank-mix with other fungicides on highly susceptible cultivars
	phosphorous acid + tebuconazole Viathon	33 + 3	 2-2.5 pt	12 H/ 0 D	The phosphite (phosphorous acid-based) fungicides listed are EPA approved and considered to be very safe products. However, there is currently an unresolved issue regarding potential residues of these products in tree nuts exported to the EU. This affects only nuts exported to the EU, but growers who know their crop is going to that market may want to consider not using phosphite fungicides until this issue is resolved. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season. Use the highest labeled rate; tank-mix with other fungicides on highly susceptible cultivars
	propiconazole + azoxystrobin Quilt Quilt Xcel	 3 & 11 3 & 11	 20-28 fl oz 20-21 fl oz	12 H/ Do not apply after shuck split or within 45 D of harvest	
	tebuconazole[4] *+ trifloxystrobin* Absolute	3 & 11	 5-7.67 fl oz	12 H/ Do not apply after shuck split or within 30 D of harvest	
	tetraconazole + triphenyltin hydroxide Minerva Duo	3 + 30	 16 oz	48 H/ 30 D	Do not make more than 5 applications per season.
	TPTH + FRAC group 3 fungicide	30 + 3	half rate + 4-6 fl oz	48 H/ 30 D	Increasing the rate of a Group 3 fungicide will be important if reduced sensitivity is known or suspected.
	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	48 H/ 30 D	
	ziram Ziram		 6-8 lb	48 H/ 55 D	Ziram as a multi-site alternative in cases where resistance to other protectants is an issue.

PECAN DISEASE CONTROL

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 lb/A) 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.
Anthracnose	Anthracnose is a disease with a long latent period; symptom expression occurs many weeks after infection. Fungicides used for control of scab have been effective in suppressing anthracnose.

[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 4 L.
[3] Thiophanate methyl is available as Topsin M 70WDG, Topsin M 70 WP, and Topsin M WSB, and Topsin M 4.5 FL (20 fl oz rate is equivalent to 1 lb of wettable powder). Topsin XTR is a premix of thiophanate methyl and tebuconazole.
[4] 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.

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.

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	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		
	phosphorous acid Fosphite Fungi-Phite KPhite Phiticide Phostrol Rampart Topaz	33	1-2 qt	4 H/ –	The phosphite (phosphorous acid based) fungicides listed are EPA approved and considered to be very safe products. However, there is currently an unresolved issue regarding potential residues of these products in tree nuts exported to the EU. This affects only nuts exported to the EU, but growers who know their crop is going to that market may want to consider not using phosphite fungicides until this issue is resolved. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season.
	MOA Group 11 fungicides	11	full rate		
	copper hydroxide Kocide 3000 Kocide 2000	M1	0.75-1.75 lb 1.5-3 lb	48 H/ –	Use higher rates when disease pressure is high and large, mature trees.

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/A/season.
- DO NOT apply more than 32 fl oz of tebuconazole/A/season.
- DO NOT apply more than 1.5 qt of fenbuconazole/A/season.
- DO NOT use more than 45 oz of Agri Tin or Super Tin 80 WP or 72 fl oz of Agri Tin Flowable or Super Tin 4 L/A/season.
- DO NOT apply more than 1.6 lb (25.6 oz) of kresoxim methyl/A/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 lb of thiophanate methyl (2.1 lb ai)/A/season.

COMMERCIAL PECAN WEED CONTROL

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

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PREEMERGENCE					
oryzalin Surflan 4AS Oryzalin 4AS		2-6 qt	2-6		Use on non-bearing and bearing trees for control of annual grasses and small seeded broadleaf weeds. Use low rate for short-term control (2-4 months); high rate for long-term control (8-12 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. Sequential applications may be used so long as total use rate does not exceed 12 qt/A/year and there are 2.5 months between applications.
diuron Karmex or Diuron 80DF Direx or Diuron 4L other brands		2-4 lb 1.6-3.2 qt	1.6-3.2		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, 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, glufosinate, or glyphosate for enhanced control of emerged weeds.
simazine Princep, Simazine 90DF Princep, Simazine 4F		2.2-4.4 lb 2-4 qt	2-4		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, glufosinate, or glyphosate for control of emerged weeds.
oryzalin Surflan 4AS Oryzalin 4AS + *simazine* Princep, Simazine 80W 90DG 4L		2-4 qt + 2.5-5 lb 2.2-4.4 lb 2-4 qt	2-4 + 2-4		Use for broad spectrum annual grass and broadleaf weed control. Provides good control of annual ryegrass. Paraquat, glufosinate, or glyphosate may be used with this tank mix to enhance control of emerged weeds. See remarks and precautions for each product.
norflurazon Solicam 80DF + *diuron* Karmex 80DF Direx 4L		2.5-5 lb + 2-3.8 lb 1.6-3 qt	2-4 + 1.6-3		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_2O 4EC Prowl or Pendimethalin 3.3EC		2-6 qt 2.4-7.3 qt	2-6		Control of annual grasses and broadleaf weeds such as pigweed. 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. Sequential applications may be used as long as total use rate does not exceed 6 qt/A and there are 30 days between applications. **Prowl H_2O has a 60 day PHI for pecans;** however, other pendimethalin formulations can only be used in non-bearing pecans.

COMMERCIAL PECAN WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PREEMERGENCE					
norflurazon Solicam 80DF		2.5-5 lb	2-4		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, glufosinate, or glyphosate for control of emerged weeds. **DO NOT apply within 60 days of harvest.** Sequential applications can be used so long as total use rate does not exceed maximum use rate for soil texture and crop.
rimsulfuron Matrix 25WG Solida 25WG Pruvin 25WG		4 oz	0.063		Provide PRE & POST control of broadleaf and annual grass weeds (see label for weed control POST). For broad spectrum residual control tank mix with diuron, oryzalin, or Prowl H_2O. Use in orchards established at least 1 year. **Rimsulfuron has a 14 day PHI for pecan.** Sequential applications may be used so long as there are 30 days between applications and total use rate does not exceed 4 oz/A broadcast basis.
flumioxazin Chateau 51WDG Tuscany 51 WDG		6-12 oz	0.19-0.38		DO NOT apply more than 6 oz/A/application to soils having a sand and/or gravel content > 80%. Trees established less than 1 year must be shielded with a grow tube or waxed container. DO NOT apply second application within 30 days of initial application. Applications after bud break can only be made with shielded application equipment. Once trees break dormancy apply with paraquat or glufosinate for non-selective postemergence control. Must use shielded application equipment if using in non-dormant pecan trees. **Flumioxazin has a 60 day PHI for pecans.**
indaziflam Alion 1.67SE		3.5-6.5 oz	0.045-0.085		Use in orchards established 3 years or longer. Sequential applications may be used as long as there are 90 days between applications and total use rate does not exceed 10.3 oz/A/year. Use rate cannot exceed 3.5 fl oz/A/application on soils having less than 1% organic matter. On soils with an organic matter content from 1-3%, no more than 5 fl oz/A can be applied in a single application and the total use rate for the year cannot exceed 8.5 fl oz/A. In order to apply more than 5 fl oz/A in a single application soil organic matter must be >3%. Alion should be tank mixed with glyphosate, glufosinate, or paraquat for non-selective POST weed control. **Alion has a 14 day PHI.** Do not use on soils having a 20% or greater gravel content.
POSTEMERGENCE					
2,4-D amine Various generic formulations 3.8SL		2-3 pt	1-1.4		**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. Sequential applications may be used as long as there are at least 30 days between applications. See product label for details.

COMMERCIAL PECAN WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POSTEMERGENCE *(continued)*					
fluazifop Fusilade DX 2EC 2 lb/gal		8-24 fl oz	0.125-0.38		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 qt/A). Make application to johnsongrass: 12-18" tall; bermudagrass: 3" tall or with 4-8" runners; annual grasses: 2-8" 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 1.5EC 1.5 lb/gal		1-2.5 pt	0.3-0.5		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 qt/A). Use low rate on annual grasses up to 6" tall; higher rates on larger annual grasses and perennial grasses. Does not control nutsedge. **DO NOT harvest within 15 days of application.**
clethodim Select 2.0EC		6-8 fl 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% ai at a rate of 1 qt/100 gal of spray solution (0.25% v/v). Make application to johnsongrass: 12-18" tall; bermudagrass: 3" tall or with 4-8" runners; annual grasses: 2-8" tall. Does not control nutsedge.
Arrow 2EC					
Select Max 1 lb/gal					
Intensity One 1 lb/gal		12-1 6 oz			
halosulfuron Sandea 75WDG		0.67-1.33 oz	0.032-0.063		For control of nutsedge, pigweed, radish, and cocklebur. Apply as directed spray under trees established for at least 1 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. Tank mix with glyphosate for broad spectrum control
paraquat Firestorm 3SL Parazone Paraquat Concentrate 3 lb/gal		1.75-2.7 pt	0.65-1		Use for broad spectrum, contact control of emerged weeds. Apply as a directed spray in at least 20 gal of water with 1-2 pt surfactant/100 gal of spray mix or 1% crop oil concentrate (1 gal/100 gal spray mix). Apply when annual weeds are succulent and 1-6" tall. DO NOT allow spray drift to contact foliage or green bark of trees since severe damage may occur. DO NOT allow animals to graze on treated areas. May be tank mixed with certain preemergence herbicides for effective residual weed control. DO NOT apply when nuts are on the ground.
Gramoxone SL 2 lb/gal		2-4 pt			
glufosinate Reckon 280 Rely 280 Lifeline 2.34 lb/gal		48-8 oz	0.88-1.5		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. DO NOT contact foliage or green bark. Glufosinate formulations are loaded with surfactant therefore NO additional nonionic surfactants or crop oil is needed. The addition of spray graded ammonium sulfate fertilizer at 8-10 lb/100 gal will enhance glufosinate activity.

COMMERCIAL PECAN WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POSTEMERGENCE *(continued)*					
glyphosate acid Numerous brands 4SL Roundup Weather Max 5.5SL		1-2 qt 11-46 fl oz	1-2		Use for broad spectrum control of emerged weeds, both annuals and perennials. Apply as a directed spray on bearing and non-bearing trees. DO NOT allow spray to contact foliage, suckers, or green bark of trees. Use low rate for control of annual weeds less than 12" 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. Try to avoid applications in late summer and fall. Trees are more sensitive to glyphosate during that time. **Allow at least 3 days between last application and harvest.**
carfentrazone Aim 2 lb/gal		0.5-2 oz	0.008-0.031		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. **DO NOT apply within 3 days of harvest.** Trees less than 2 years old must be shielded from direct contact with Aim. Sequential applications may be used as long as total use rate does not exceed 7.9 oz/A/year and there are 14 days between applications. Best results obtained when applied to weeds in the 2-3 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 4SL Roundup Weather Max 5.5 S80 WDGL		2-16 fl oz 1.3-5.85	0.06-0.5 0.06-0.25		Use for vegetative suppression in row middles. Apply 1-2 weeks after full green-up of bahiagrass or bermudagrass, or after grass has been mowed to a uniform height of 3-4". 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 lb 4 lb 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 lb + 4 lb 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 pt (April) 1.5-2 pt (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. When mixing Boron with imidacloprid, check pH of the solution and add a n acidifying agent when necessary to bring pH below 7.5.
	Boron Plus (10% B)	1 pt	
	Top Side Liquid Boron (6%)	1 pt	

NOTES

FORMULATION[1] ABBREVIATIONS

a.i. = active ingredient	EC = emulsifiable concentrate	S = sprayable powder
AC = aqueous concentrate	EL = emulsifiable liquid	SC = spray concentrate
AS = aqueous suspension	F = flowable	SP = soluble powder
DF = dry flowable	FC = flowable concentrate	W = wettable powder
DG = dispersible granules	G = granules	WDG = water dispersible granular
B = bait	L = liquid	WDL = water dispersible liquid
D = dust	LC = liquid concentrate	WM = water miscible
E = emulsifiable	M = microencapsulated	WP = wettable powder

[1] Numbers preceding abbreviations for liquid formulations equal pounds of active ingredient per gallon (e.g., 4EC = 4 lb/gal emulsifiable concentrate); numbers preceding abbreviations for solid formulations equal percent active ingredient by weight (e.g., 50WP = 50 percent wettable powder).

METHOD OR TIME OF APPLICATION ABBREVIATIONS

CR = cracking stage	PEI = pre-emergence incorporated	PRE = pre-emergence
LV = low volume	PO = post-emergence	PT = post-transplant
NS = nonselective	POT = post-emergence over-the-top	RCS = recirculating sprayer
PDS = post-emergence directed spray	PP = pre-plant	ULV = ultra low volume[2]
PE = pre-emergence on surface	PPI = pre-plant soil incorporated	WICK = rope wick applicator

[2] Ultra low volume refers to a total spray volume of one-half gallon or less per acre.

RATE CALCULATIONS AND SPRAYER CALIBRATIONS

See the 2016 Georgia Pest Management Handbook or the "Pesticide Safety & Other Pesticide Information" section online at www.ent.uga.edu/pest-management/

MEASURES AND EQUIVALENTS

tsp	=	teaspoon			1 teaspoon	=	4.9 milliliters
Tbs.	=	tablespoon	1 Tbs	=	3 teaspoons	=	14.8 milliliters
fl oz.	=	fluid ounce	1 fl oz	=	2 tablespoons	=	29.6 milliliters
c	=	cup	1 c	=	8 fluid ounces	=	236.6 milliliters
pt	=	pint(s) (1.04 lb of water)	1 pt	=	2 cups	=	473.2 milliliters
pt/100	=	pint(s) per 100 gal	1 pt/100	=	1 teaspoon per gal		
qt	=	quart(s) (2.09 lb of water)	1 qt	=	2 pints	=	946.4 milliliters
gal	=	gallon(s) (8.35 lb of water)	1 gal	=	4 quarts	=	3.7854 liters
oz	=	ounce			1 ounce	=	28.35 grams
lb	=	pound	1 lb	=	16 ounces	=	453.59 grams
in	=	inch	1 in	=	1000 mils	=	2.54 centimeters (25,400 microns)
ft	=	feet	1 ft	=	12 inches	=	30.48 centimeters
yd	=	yard	1 yd	=	3 feet	=	91.44 centimeters
mi	=	mile	1 mi	=	5,280 feet	=	1,609 meters (16.09 kilometers)
sq in	=	square inch			1 square inch	=	6.45 square centimeters
sq ft	=	square feet	1 sq. ft	=	144 square inches	=	929.03 square centimeters
A	=	acre	1 A	=	43,560 square feet	=	0.4047 hectare
cu in	=	cubic inch			1 cubic inch	=	16.387 cubic centimeters
cu ft	=	cubic feet	1 cu ft	=	1,728 cubic inches	=	0.0283 cubic meter
cu yd	=	cubic yard	1 cu.yd	=	27 cubic feet	=	0.7646 cubic meter
ppm	=	parts per million	1 ppm	=	1,000 parts per billion	=	1 milligram/ kilogram[3]
psi	=	pounds per square inch			1 psi	=	70.3 gram-force per square centimeter

[3] 1 milligram/kilogram or 1 p.p.m. is equal to 1 milligram/liter of water.

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