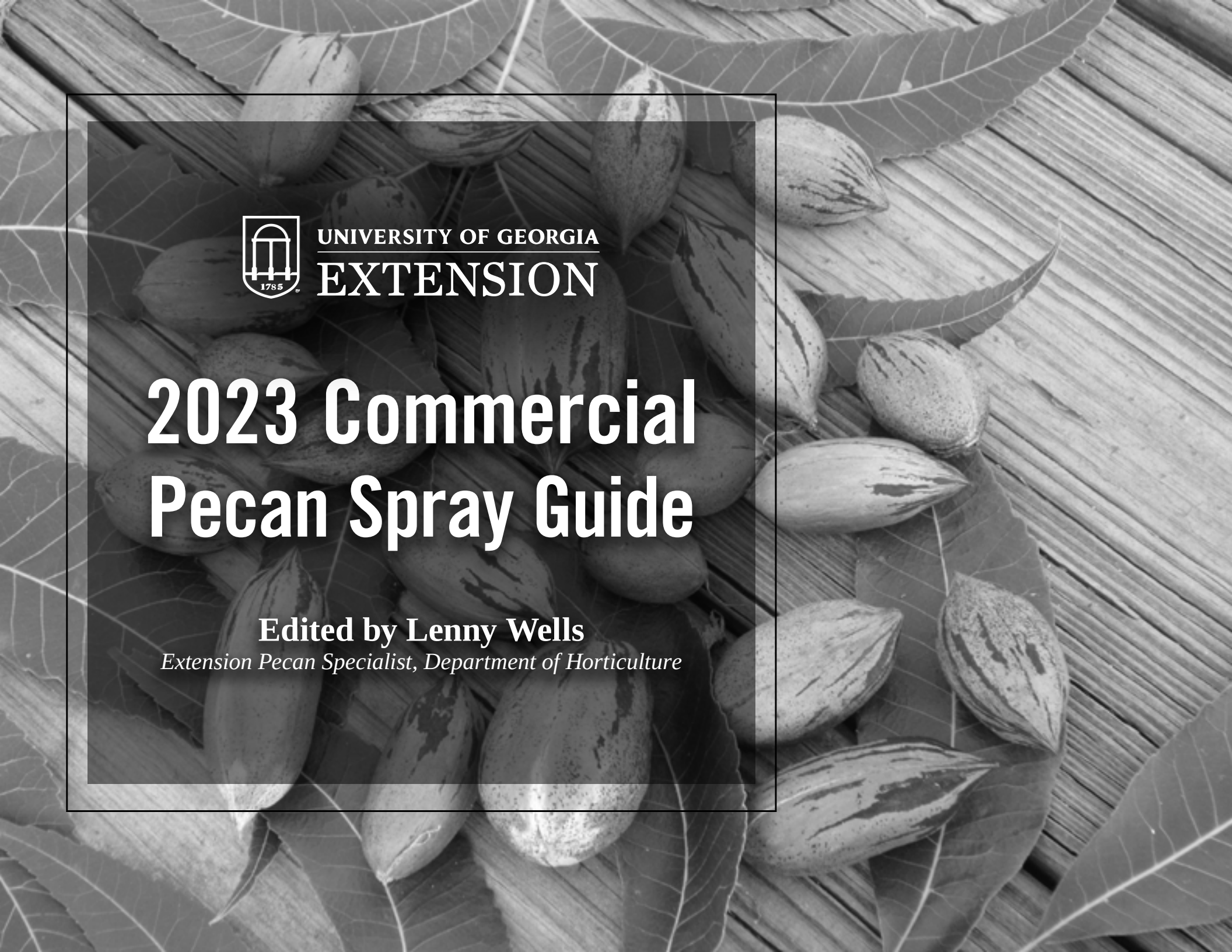

UNIVERSITY OF GEORGIA
EXTENSION

2023 Commercial Pecan Spray Guide

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ONLINE RESOURCES

https://site.extension.uga.edu/pecan/
https://pecans.uga.edu/
https://wiki.bugwood.org/Pecan/Georgia

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

COMMERCIAL PECAN INSECT CONTROL (BEARING TREES)

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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 damage should be monitored mid-season by examining fallen nuts for a whitish spot on the side. Pecan weevil populations should be monitored by survey traps.

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS
Phylloxera	*thiamethoxam* Centric 40WG	4A	2–2.5 oz	12 H/ 14 D	Treat trees with a recent history of heavy infestation and surrounding trees. Apply at budbreak with the first pre-pollination spray.
	imidacloprid Several formulations	4A	See label	12 H/ 7 D	**Note:** Other *imidacloprid* formulations are available. Read labels carefully to find the proper rate and maximum allowable limits.
Spittlebugs	*imidacloprid* Several formulations	4A	See label	12 H/ 7 D	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.
Pecan Nut Casebearer	*spinosad* Spintor 2SC	5	4–10 oz	4 H/ 1 D	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 the pyrethroids, not be used in early-or mid-season to conserve beneficial insect populations. (See Special Considerations section.)
	diflubenzuron Dimilin 2L	15	8–16 oz	12 H/ 28 D	
	chlorantraniliprole Vantacor	28	1.2–2.5 oz	4H/ 10D	
	clothianadin Belay	4A	3–6 oz	12 H/ 21 D	
	methoxyfenozide Intrepid 2F	18	4–8 oz	4 H/ 7 D	
	methoxyfenozide + *spinetoram* Intrepid Edge	5 + 18	4–6.4 oz	4 H/ 7 D	
	tolfenpyrad Apta	21	17–27 oz	12 H/ 14 D	**DO NOT** apply more than 1 application. No more than 27 oz/A/season.
	cyantraniliprole + *abamectin* Minecto Pro	6 + 28	8–12 oz	12 H/ 21 D	No more than 2 consecutive applications, no more than 24 oz/A/season.
Mites	*abamectin* Agri-Mek SC, Abba, and others	6	See label for product-specific rates	12 H/ 21 D	A non-ionic surfactant or horticultural oil MUST be added to the tank.
	bifenazate Acramite 4SC	Unclassified	12–24 oz	12 H/ 14 D	See Timing and Remarks top of next page.

COMMERCIAL PECAN INSECT CONTROL

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS
Mites (*continued*)	*spirodiclofen* Envidor 2SC	23	14–18 oz	12 H/ 7 D	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. Magister SC requires no more than one application per year.
	fenpyroximate Portal	21A	2 pt	12 H/ 14 D	
	pyridaben Nexter SC	21	5.2–10.67 oz	24 H/ 7 D	
	hexythiazox Savey 50DF	10A	3–6 oz	12 H/ 28 D	
	etoxazole Zeal SC	10B	2–3 oz	12 H/ 28 D	
	fenazaquin Magister SC	21	24–36 oz	12 H/ 7 D	
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 (MOA) of insecticides between treatments to avoid resistance development. Many generic formulations of *imidacloprid* are available. Read label carefully for recommended rate. *Imidacloprid* alone may not control yellow and black-margined aphids. It is suggested that pyrethroid materials (*cypermethrin*, *bifenthrin*, etc.) not be used, alone or in combination, in early- or mid-season applications. For PQZ, spray no more than 2 applications or 4.8 fl oz per acre per year. **DO NOT** apply more than 1 application of Apta, no more than 27 oz/A/season. Use the 14 oz rate for black pecan aphid control.
	acetamiprid Assail 30SG	4A	2.5–9.6 oz	12 H/ 14 D	
	afidopyropen Sefina	9D	3.0–6.0 oz	12 H/ 7D	
	clothianidin Belay	4A	3–6 fl oz	12 H/ 21 D	
	flonicamid Beleaf, Carbine	9C	2–2.8 oz	12 H/ 40 D	
	flupyradifurone Sivanto 200 SL	4D	7.0–10.5 oz	4 H/ 7 D	
	imidacloprid Several formulations	4A	See label	12 H/ 7D	
	pymetrozine Fulfill 50WG	9B	4 oz	12 H/ 14 D	
	pyridaben Nexter	21	5.2–10.67 oz	24 H/ 7 D	
	pyrifluquinazon PQZ	9B	2.4–3.2 oz	12 H/ 7 D	
	sulfoxaflor Closer SC Transform WG	4C	 1.5–2.75 oz 0.75–1.5 oz	12 H/ 7 D	
	thiamethoxam Centric 40 WG	4A	2–2.5 oz	12 H/ 14 D	
	tolfenpyrad Apta	21A	17–27 oz	12 H/ 14 D	
	SYSTEMIC APPLICATIONS				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.
	imidacloprid Admire Pro	4A	7–14 fl oz	12 H/ 7 D	

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS
Black Pecan Aphid	SAME INSECTICIDES AS FOR YELLOW APHIDS	See list for yellow aphids	See list for yellow aphids. Please note that some products have different rates for black pecan aphids.	See list for yellow aphids	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. *Gibberellic acid* is a plant growth regulator that prevents damage from black pecan aphid feeding and inhibits establishment in the orchard. It does not affect aphids directly and will not control any other pest, including yellow aphids. Three applications should be made at 2-week intervals, beginning in mid-July, applying 10 oz (or 5 oz of ProGibb LV Plus) each time.
	gibberellic acid ProGibb 4% ProGibb LV Plus	N/A	10 oz 5 fl oz	N/A	
Hickory Shuckworm	*chlorantraniliprole* Vantacor	28	1.2–2.5 oz	4H/ 10D	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. 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.
	clothianadin Belay	4A	3–6 oz	12 H/ 21 D	
	diflubenzuron Dimilin 2L	15	8–16 oz	12 H/ 28 D	
	methoxyfenozide Intrepid 2F, Turnstyle	18	4–8 oz	4 H/ 7 H	
	methoxyfenozide + *spinetoram* Intrepid Edge	5 + 18	4–6.4 oz	4 H/ 7 D	
	tolfenpyrad Apta	21A	17–27 oz	12 H/ 14 D	**DO NOT** apply more than 1 application, no more than 27 oz/A/season.
	abamectin + *cyantraniliprole* Minecto Pro	6 + 28	8–12 oz	24 H/ 21 D	No more than 2 consecutive applications, no more than 24 oz/A/season.
	chlorantraniliprole + *lambda-cyhalothrin* Besiege	3 + 28	6–12.5 oz	24 H/ 14 D	Besiege contains a pyrethroid, and may flare aphids and mites if used in early or mid-season. The best fit is for late season shuckworm.

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS
Pecan Weevil	*carbaryl* Carbaryl 80S Sevin 4F Sevin XLR	1A	3 lb 2–5 qt	24 H/ 14 D	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. Grandevo has provided levels of control comparable with chemical insecticides. Grandevo can also contribute to aphid control (and thus will not flare aphid populations). Harm to beneficial insects (lady beetles and lacewings) has not been detected. Grandevo can be used in organic pecan production; it is OMRI listed and NOP compliant. The use of an adjuvant is recommended, avoid acidifying agents. NOTE: Several pyrethroids 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.
	Chromobacterium subtsugae Grandevo WDG	UNK—Dead bacterial composition	2–3 lbs	4 H/ 0 D	
	Various pyrethroids Asana XL, Ammo, Baythroid, Brigade, Mustang Max	3	See label for product-specific rates	24 H/ 21 D	
Ants: Argentine Ants, Acrobat Ants, Fire Ants, Others	Baits Extinguish, Reemit 0.5 G, Altrevin, and others	Various	1.0–1.5 lb/A	Various	The best approach is to apply a bait twice per season, generally in late April–early May and again in September.
	chlorpyrifos Lorsban, others	1B	4 pts	24 H/ 14 D	*Chlorpyrifos* is labeled for orchard floor treatment for ant control. Do not make more than 2 applications or apply more than a total of 8 pints per acre per season. Do not allow livestock to graze in treated orchards.

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 can build their colonies inside the herbicidal tree guards on young trees resulting in buildup of soil along the covered trunk which can be detrimental to the trees. Fire ants should be controlled or at least kept out of pecan trees. Best approach is probably applying an ant bait in late spring (see more info in the table above).

BORERS: AMBROSIA BEETLES AND FLATHEADED APPLE TREE BORER

Although older trees can be attacked by ambrosia beetles, young trees (<5-yr old) are more susceptible to attacks by wood-boring beetles. Ambrosia beetles attack trees subjected to stress-inducing factors such as water-logged conditions, diseases, frost injury, etc. Thus, keeping trees healthy is the primary line of defense against ambrosia beetle infestations. Trapping for flight activity along orchard borders, using ethanol-baited log traps, is recommended to time the sprays in the spring. Once flight activity and attacks are detected, spraying pyrethroids on the tree trunks every 7–10 days can be done.

For flatheaded apple tree borer, treatment of *imidacloprid* by drenching or via the irrigation system on young trees could provide protection for about three years. Please see the maximum limits for neonicotinoids.

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 *Southeastern 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: **extension.uga.edu/publications/for-sale.html**

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, an 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, Apurba Barman, and Andrew Sawyer, Extension Entomology
Tim Brenneman, Plant Pathology

TIME OF APPLICATION	PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	INSTRUCTIONS AND REMARKS
			FOLIAR SPRAYS			
Bud Break When first buds open.	Foliar disease	Fungicide				Spray sufficient volume for thorough coverage. For fungicide options, refer to the pre-pollination section for Pecan Disease Control. The phosphorous acid fungicides are particularly useful with their excellent activity on foliar diseases, highly systemic nature, and low risk of fungicide resistance. Scout for pecan bud moth injury at bud break and time sprays before larvae bore into the shoots.
	Pecan bud moth	*methoxyfenozide* Intrepid 2F	18	3–4 oz	4 H/ —	
		methoxyfenozide + *spinetoram* Intrepid Edge	5 + 18	4–6.4 oz	4 H/ —	
		abamectin + *cyantraniliprole* Minecto Pro	6 + 28	8–12 oz	12 H/ —	No more than 24 oz/A/season.
	Hickory shoot curculio	Various pyrethroids			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				Spray sufficient volume for thorough coverage. Continue scouting for pecan bud moth injury and time sprays before larvae bore into the shoots. The phosphorous acid fungicides are particularly useful with their excellent activity on foliar diseases, highly systemic nature, and low risk of fungicide resistance.
	Pecan bud moth	*diflubenzuron* Dimilin 2L	15	8–16 oz	24 H/ —	
		Imidan 70WSP		1.5 lb		
		methoxyfenozide Intrepid 2F	18	4–8 oz	4 H/ —	
		abamectin + *cyantraniliprole* Minecto Pro	6 + 28	8–12 oz	12 H/ —	

Tim Brenneman, Department of Plant Pathology

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
PRE-POLLINATION APPLICATIONS: EVERY 10 14 DAYS FROM BUD BREAK THROUGH NUT SET					
Scab; Downy Spot	*azoxystrobin* Abound Azaka	11	12 fl oz	4 H/ 45 D	See MOA info on next page.
	difenoconazole + *azoxystrobin* Quadris Top Amistar Top	3 + 11	10–14 fl oz	12 H/ 45 D	
	difenoconazole + *tea tree oil* Regev	3 + 46	8.5 fl oz	12 H/ 14 D	Minimum application interval is 14 days. Refer to label for other restrictions.
	fenbuconazole Enable 2F	3	8 fl oz	12 H/ Do not apply after shuck split or within 28 D of harvest	See MOA info on next page. Minimum application interval for Cevya is 7 days.
	flutriafol Topguard	3	7–14 fl oz	12 H/ 7 D	
	kresoxim-methyl Sovran Narvos 50WDG	11	2.4–3.2 oz	12 H/ 45 D	
	mefentrifluconazole Cevya	3	5 fl oz	12 H/ 14 D	
	metconazole Quash	3	3.5 oz	12 H/ 25 D	
	phosphorous acid Kphite 7LP Phostrol ProPhyt FungiPhite Reliant Phiticide	33	2–8 pt 2.5–5 pt 2–5 pt 2–2.5 pt 4 pt 2–5 pt	4 H/ —	With group 33 products, higher rates are best for stand-alone sprays, but lower rates (2–3 pt) can be added to complement other fungicides. The *phosphorous acid* fungicides are particularly useful with their excellent activity on foliar diseases, highly systemic nature, and low risk of fungicide resistance. Only *phosphorous acid* products that are labeled for control of pecan diseases are recommended. See MOA info on next page.
	phosphorous acid + *tebuconazole* Viathon	33 + 3	2–2.5 pt	12 H/ 0 D	
	propiconazole Orbit Propimax EC Bumper 41.8EC Topaz	3	8 fl oz	12 H/ Do not apply after shuck split	

PECAN DISEASE CONTROL

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
PRE-POLLINATION APPLICATIONS: EVERY 10 14 DAYS FROM BUD BREAK THROUGH NUT SET (*continued*)					
Scab; Downy Spot (*continued*)	*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	**MOA Group 1:** Risk for resistance is high. Use should be limited. When conditions are very favorable for scab, use in combination with either a full rate of TPTH or *dodine*. Limit the use to 1 or 2 applications per season. Available as Topsin M 70WDG, Topsin M 70 WP, and Topsin M WSB, and Topsin M 4.5 FL. Topsin XTR is a premix of *thiophanate methyl* and *tebuconazole*.
	pyraclostrobin Headline	11	6–7 fl oz	12 H/ 14 D	**MOA Group 3:** Resistance risk is moderate. For best results, tank mix *tebuconazole* with a surfactant. Do not add a surfactant if mixing with other fungicides. Increasing the rate of a Group 3 fungicide will be important if reduced sensitivity is known or suspected. Stand-alone use is not recommended where reduced sensitivity is known or suspected.
	tebuconazole Folicur 3.6F Tebuzole 3.6F Monsoon Orius 3.6F Toledo 3.6F	3	8 fl oz	12 H/ Do not apply after shuck split	**MOA Group 11:** Resistance risk is moderate. Do not make more than 2 sequential applications. If only using solo products, Group 11 fungicides should not be used in more than ⅓ of the total number of fungicide applications. If using Group 3 tank-mixed with other modes of action, they should not be used in more than ½ of the total number of fungicide applications. Stand-alone use is not recommended where reduced sensitivity is known or suspected.
	tetraconazole Andiamo	3	8.5 fl oz	12 H/ 30 D	**MOA Group 30:** Resistance risk is low.
	tetraconazole + *azoxystrobin* Brixen	3 + 11	13–20 fl oz		**MOA Group 33:** Resistance risk is low. For best control apply in 100 GPA by ground. Three to five applications are generally recommended. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season. Do not use when there is a phosphate deficiency. Do not use these as stand-alone sprays for nut scab on very susceptible cultivars or high disease pressure.
	tebuconazole + *azoxystrobin* Custodia Helmstar Plus	3 + 11	8.6–17.2 7.2–14.4	12 H/ 45 D	**MOA Group U12:** Resistance risk is low. Do not use on Moore, Van Deman, Barton, or Shawnee. Do not use a surfactant. Do not use with foliar zinc treatments.
	tebuconazole + *trifloxystrobin* Absolute	3 + 11	5–7.67 fl oz	12 H/ Do not apply after shuck split or within 30 D of harvest	For any tank mix combination of *dodine*, TPTH, Group 3, or Group 11 fungicides, 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.
	flutriafol + *azoxystrobin* Topguard EQ	3 + 11	5.0–8.0 fl oz	12 H/ 45 D	
	tetraconazole + *triphenyltin hydroxide* Minerva Duo	3 + 30	16 oz	48 H/ 30 D	
	thiophanate methyl + TPTH **or** *dodine*	1 + 30 **or** U12	1 lb + half rate **or** 25 fl oz	3 D/ Do not apply after shuck split	
	triphenyltin hydroxide (TPTH) + FRAC Group 3 fungicide	30 + 3	half rate + full rate	48 H/ 30 D	

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
PRE-POLLINATION APPLICATIONS: EVERY 10 14 DAYS FROM BUD BREAK THROUGH NUT SET (*continued*)					
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.				
POST-POLLINATION APPLICATIONS: EVERY 10 21 DAYS FROM NUT SET TO SHELL HARDENING					
Scab	*pydiflumetofen* + *difenoconazole* Miravis Top	7 + 3	13.6 fl oz	12 H/ 45 D	
	pydiflumetofen + *fludioxonil* Miravis Prime	7 + 12	6.8–9.1 fl oz	12H/ 14D	
	dodine Dodine 4L Elast 400F	U12	48 fl oz 48 fl oz	48 H/ Do not apply after shuck split	
	dodine + Group 3 **or** Group 11 fungicide	U12 + 3	25–48 fl oz + full rate	48 H/ Do not apply after shuck split	
	dodine + TPTH	U12 + 30	25–48 fl oz + 6–12 fl oz (liquid) *or* 3.75–7.5 oz (wettable)	48 H/ Do not apply after shuck split	
	phosphorous acid Kphite 7LP Phostrol ProPhyt Reliant Phiticide	33	highest label rate	4 H/ —	
	propiconazole + *azoxystrobin* Quilt Quilt Xcel	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 + *azoxystrobin* Custodia Helmstar Plus	3 + 11	8.6–17.2 7.2–14.4	12 H/ 45 D	
	flutriafol + *azoxystrobin* Topguard EQ	3 + 11	5.0–8.0 fl oz	12 H/ 45 D	

PECAN DISEASE CONTROL

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
POST-POLLINATION APPLICATIONS: EVERY 10 21 DAYS FROM NUT SET TO SHELL HARDENING (*continued*)					
Scab (*continued*)	*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	**MOA Group 1:** Risk for resistance is high. Use should be limited. When conditions are very favorable for scab, use in combination with either a full rate of TPTH or *dodine*. Limit the use to 1 or 2 applications per season. Available as Topsin M 70WDG, Topsin M 70 WP, and Topsin M WSB, and Topsin M 4.5 FL. Topsin XTR is a premix of *thiophanate methyl* and *tebuconazole*. **MOA Group 3:** Resistance risk is moderate. For best results, tank mix *tebuconazole* with a surfactant. Do not add a surfactant if mixing with other fungicides. Increasing the rate of a Group 3 fungicide will be important if reduced sensitivity is known or suspected. Stand-alone use is not recommended where reduced sensitivity is known or suspected. **MOA Group 11:** Resistance risk is moderate. Do not make more than 2 sequential applications. If only using solo products, Group 11 fungicides should not be used in more than ⅓ of the total number of fungicide applications. If using Group 3 tank-mixed with other modes of action, they should not be used in more than ½ of the total number of fungicide applications. Stand-alone use is not recommended where reduced sensitivity is known or suspected. **MOA Group 30:** Resistance risk is low. **MOA Group 33:** Resistance risk is low. For best control apply in 100 GPA by ground. Three to five applications are generally recommended. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season. Do not use when there is a phosphate deficiency. Do not use these as stand-alone sprays for nut scab on very susceptible cultivars or high disease pressure. **MOA Group U12:** Resistance risk is low. Do not use on Moore, Van Deman, Barton, or Shawnee. Do not use a surfactant. Do not use with foliar zinc treatments. For any tank mix combination of *dodine*, TPTH, Group 3, or Group 11 fungicides, 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.
	difenoconazole + *azoxystrobin* Amistar Top	3 + 11	8–14 fl oz	12 H/ Do not apply after shuck split or within 30 D of harvest	
	tetraconazole + *azoxystrobin* Brixen	3 + 11	13–20 fl oz	12 H/ 45 D	
	tetraconazole + *triphenyltin hydroxide* Minerva Duo	3 + 30	16 oz	48 H/ 30 D	
	thiophanate methyl + TPTH **or** *dodine*	1 + 30 **or** U12	1 lb + half rate **or** 25 fl oz	3 D/ Do not apply after shuck split	
	TPTH + Group 3 or Group 11 fungicide	30 + 3	6–12 fl oz (liquid) *or* 3.75–7.5 oz (wettable) + full rate	48 H/ 30 D	
	triphenyltin hydroxide (TPTH) 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.

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 *dodine*.

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, particularly FRAC Groups 3 and 11 and the phosphorous acid-based fungicides

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:

- The interval between fungicide sprays should not exceed 14 days until shell hardening.
- On varieties with a summer growth flush, the spray interval should be tightened so that no more than 10 days pass from the onset of the growth flush until a fungicide spray is made.
- 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) during periods of extended wetness and moderate temperatures (<86°F) occurring between shell hardening and shuck split.				
	TPTH	30	full rate		
	phosphorous acid Fosphite, KPhite Phiticide, Phostrol Rampart	33	full rate	4 H/ —	The *phosphite* (*phosphorous acid* based) fungicides listed are EPA approved and considered to be very safe products. 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.

COMMERCIAL PECAN WEED CONTROL

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HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/ PHI	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PREEMERGENCE					
oryzalin Surflan 4AS *Oryzalin* 4AS	3	 2–6 qt	2–6	24 H/ not listed	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* 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 XP or Diuron 80DF Direx or Diuron 4L other brands	7	 2–4 lb 1.6–3.2 qt	 1.6–3.2	12 H/ not listed	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	5	 2.2–4.4 lb 2–4 qt	 2–4	48 H/ 21 D	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	24 H/ not listed 48 H/ 21 D	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	12 H/ 60 D 24 H/ 60 D	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	3	 2–6 qt 2.4–7.3 qt	2–6	24 H/ 60 D	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.
norflurazon Solicam 80DF	12	 2.5–5 lb	2–4	12 H/ 60 D	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.

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/ PHI	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PREEMERGENCE (*continued*)					
rimsulfuron Matrix 25WG Solida 25WG Pruvin 25WG Grapple 25 WG	2	4 oz	0.063	4 H/ 14 D	Provide pre- and 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 Flumi 51 WDG Chateau EZ Tuscany 4 SC	14	6–12 oz 6–12 fl oz	0.19–0.38	12 H/ 60 D	**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.
penoxsulam + *oxyfluorfen* Pindar GT	2 + 14	1.5–3 pt	0.75–1.50	24 H/ 60 D	Apply Pindar GT to pecan trees that have been planted at least 9 months and longer. Use trunk guards to protect plants until adequate mature bark has developed. Can be used as a bearing and non-bearing dormant application. Non-bearing are those trees which will not bear a crop within one year after treatment. Applications can be made beginning after pecan harvest up to emergence of green leaf tissue the following season. For best results, apply prior to weed emergence of broadleaf and grass species. Do not apply more than 4.5 pts per acre per year. Tank mix with *oryzalin* or *pendimethalin* for expanded redual control of annual grasses. See label for use rate restrictions.
indaziflam Alion 1.67SE	29	3.5–6.5 oz	0.045–0.085	12 H/ 14 D	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. Do not treat soil around trees with cracks or channels, or with depressions.
indaziflam + *rimsulfuron* Centrus WDG	29 + 2	3–5.6 oz	0.076–0.143	12 H/ 14 D	Centrus is a premix of the active ingredients in Alion and *rimsulfuron*. It will provide PRE and POST control of certain annual broadleaf weeds. Do not use on soils with 20% or more gravel content. Use on trees established 3 years or more. Tank mix with *glyphosate*, *glufosinate*, or *paraquat* for non-selective POST weed control.
POSTEMERGENCE					
2,4-D amine Various generic formulations 3.8SL	4	2–3 pt	0.8–1.2	48 H/ 60 D	**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.
2,4-D choline Embed Extra	4	1–4 pt	0.4–1.8	48 H/ 60 D	Embed Extra contains the same active ingredient used on *2,4-D* tolerant crops. Use only orchards established at least 1 year or longer. **DO NOT** apply within two weeks either side of bloom. Embed Extra has a 60 day PHI for pecan. Do not use on sandy or loamy sand soils. Allow 75 days between sequential applications. **DO NOT** allow spray to drift onto or contact foliage, fruit, stems, or trunks of trees.
bentazon Broadloom 4EC	6	1–2 pt	0.5–1		**For application in nonbearing orchards only!** Apply in a minimum spray volume of 20 gallons per acre. The addition of crop oil concentrate at 1% v/v (1 gal per 100 gal of spray solution) is necessary for optimum herbicide performance. Do not apply more than 2 pts per acre per application or more than 2 lb ai per acre per year. For yellow nutsedge control apply 1.5–2 pts per acre when yellow nutsedge has 4–6 leaves and is less than 6" tall. Make second application 10 days after the initial application.

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