

# **FRUIT AND NUTS: COMMERCIAL IPM GUIDES**

Commercial producers are encouraged to contact their local County Extension Agent for information on the various regional fruit guides and other orchard management resources. Inexperienced growers are encouraged to use caution applying pesticides; several materials used are quite toxic and pose an applicator risk if not used with appropriate care. PDFs of the 2017 Fruit IPM guides will be available online prior to the initiation of the 2017 season.

**INTEGRATED ORCHARD MANAGEMENT GUIDE FOR COMMERCIAL APPLES IN THE SOUTHEAST**

**SOUTHEAST REGIONAL BLACKBERRY AND RASPBERRY INTEGRATED MANAGEMENT GUIDE**

**SOUTHEAST REGIONAL BLUEBERRY INTEGRATED MANAGEMENT GUIDE**

**SOUTHEAST REGIONAL BUNCH GRAPE INTEGRATED MANAGEMENT GUIDE**

**SOUTHEAST REGIONAL MUSCADINE GRAPE INTEGRATED MANAGEMENT GUIDE**

**SOUTHEASTERN PEACH, NECTARINE AND PLUM PEST MANAGEMENT AND CULTURE GUIDE**

**SOUTHEAST REGIONAL STRAWBERRY INTEGRATED MANAGEMENT GUIDE**

# COMMERCIAL BLACKBERRY AND RASPBERRY WEED CONTROL

Wayne E. Mitchem, Extension Associate – Fruit Weed Control

Mark A. Czarnota, Extension Horticulture – Weed Science

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
<b>PREPLANT</b>					
<i>bentazon</i> Basagran 4SL		1.5-2 pt	0.75-1	PHI 1 Year	Apply at or before planting only. Add 2 pints of crop oil concentrate in 20-50 gal of water/A. <b>DO NOT</b> apply within 1 year of harvest. Sequential applications needed for yellow nutsedge control.
<i>carfentrazone</i> Aim EC 2.0EC Aim EW 1.9EW		0.8-1.5 fl oz	0.013-0.023		For annual broadleaf weeds including morningglory, pigweed, and spiderwort. Apply prior to planting to weeds less than 4” in height or rosettes less than 3” across. Coverage is essential for weed control. Add a non-ionic surfactant at 1 qt/100 gal of spray solution. May be tankmixed with glyphosate.
<i>glyphosate</i> Various trade names and formulations available		See label	See label		Apply to emerged weeds before transplanting. Perennial weeds may require higher rates of glyphosate (i.e. 4 lb ai/A). Some formulations of glyphosate may require the addition of an adjuvant.
<b>PREEMERGENCE</b> <sup>1,2,3</sup>					
<i>dichlobenil</i> Casoron 4G Casoron CS		100 lb 1.4-2.8 gal	4 2-4		Apply in early winter to plants that have been established 1 year or more. <b>DO NOT</b> apply during new shoot emergence. Use no later than mid-February.
<i>mesotrione</i> Callisto 4L		3-6 oz	0.094-0.19		May be applied pre or post bloom, direct to the base of the plant. Apply either a single 6 oz application or two 3 oz split applications can be made. If split application, they must be 14 days apart. If early postemergence weed control is desired, it is recommended that crop oil concentrate is added to the spray solution (1% v/v). Temporary bleaching or chlorosis may occur to caneberry foliage.
<i>napropamide</i> Devrinol 50WDG		8 lb	4		Use for control of annual grasses and small seeded broadleaf weeds. Apply as a directed spray to base of plants. May be used on first-year plantings. <b>NOTE:</b> Use only half this rate the first year if root cuttings are planted.
<i>norflurazon</i> Solicam 80WDG		2.5-5 lb	2-4	PHI 60 D	Apply as a directed spray from fall to early spring when the crop is dormant and before weeds emerge. Make only one application per year. Raspberry and blackberry must be <b>established 12 months prior to use</b> . Application of Solicam may result in temporary bleaching or chlorosis of the leaves from which the plant will recover. <b>60 day preharvest interval.</b>
<i>oryzalin</i> Surflan 4AS Oryzalin 4AS Surflan 85 DF		2-6 qt 2.4-7.1 lb	2-6		Controls annual broadleaf weeds and some annual grasses. Apply 2-4 lb ai/A in spring or apply a split application of 2 lb ai/A in spring followed by 2 lb ai/A in fall. Apply spring applications before annual weeds emerge and before bud break. On plantings less than 6 months old, use 1 lb ai/A. <b>DO NOT</b> apply to newly established plantings until the soil has settled and no cracks are present. Apply before annual weeds emerge or add Gramoxone or glyphosate for control of emerged weeds. <b>DO NOT</b> apply when fruit is present.

COMMERCIAL BLACKBERRY AND RASPBERRY WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
<b>PREEMERGENCE <sup>1,2,3</sup> (continued)</b>					
<i>rimsulfuron</i> Solida 25 WDG		4 oz	.063	PHI 21 D	Rimsulfuron has POST and PRE activity on broadleaf and some grass weeds. For broad spectrum residual control of annual grass weeds tank mix rimsulfuron with oryzalin or Sinbar. For nonselective POST weed control, tank mix rimsulfuron with paraquat. Do not treat blackberry plantings established less than 1 year. Rainfall for herbicide activation is necessary within 2-3 weeks of application. Do not apply within 21 days of harvest. The pH of spray solution should be in the range of 4-8. Rimsulfuron may be applied as a sequential application so long as total use rate does not exceed 4 oz/A/year and application is made in band to less than 50% of orchard floor. Allow at least 30 days between sequential applications. To reduce the risk of primocane injury apply prior to primocane emergence or wait until primocanes are 3 ft tall. If primocanes are emerged at the time of application, chlorosis and stunting is likely but in most instances those primocanes recover.
<i>simazine</i> Princep 4L, 90WDG Various generic formulations		2.2-4.4 lb 2-4 qt	2-4		Apply 2-4 lb ai/A in spring or apply a split application of 2 lb ai/A in spring followed by 2 lb ai/A in fall. Apply spring applications before annual weeds emerge and before bud break. On plantings less than 6 months old, use 1 lb ai/A. <b>DO NOT</b> use on gravelly, sand, or loamy sand soils. <b>DO NOT</b> apply when fruit is present. Apply in combination with oryzalin or Solicam for improved annual grass control.
<i>oryzalin</i> Surflan 4AS Oryzalin 4AS + <i>simazine</i> Princep 4L, 90WDG		2-4 qt + 2.2 lb 2 qt	2-4 + 2		Use for broad spectrum annual grass and broadleaf weed control. Especially useful on plantings less than 6 months old, use 1 lb ai/A of simazine. <b>DO NOT</b> apply when fruit is present. <b>DO NOT</b> use on gravelly, sand, or loamy sand soils.
<i>sulfentrazone + carfentrazone</i> Zeus Prime XC		7.7-15.2 fl oz	0.19 + 0.02 to 0.37 + 0.04	PHI 3 D	Apply as directed spray to caneberrys that have been established 2 years or longer. If applying in a band and 50% or less of the area is treated Zeus may be applied twice within a 12 month period. Allow at least 60 days between applications. <b>Zeus has a 3 day PHI.</b> Spray water must have a pH from 5-9 for optimum herbicide performance. Tank mix with paraquat for non-selective POST weed control. Sequential applications of Zeus are the most effective on yellow nutsedge. See label for details. For broad spectrum residual control of annual grasses tank mix with oryzalin. Zeus has no postemergence activity on grass weeds.
<i>terbacil</i> Sinbar 80WDG		0.5-2 lb	0.4-1.6		Use before fruit set in spring or after harvest either before weeds emerge or shortly after weeds emerge. Use only in plantings established 1 year or more. <b>DO NOT</b> spray foliage. <b>DO NOT</b> use on sandy soils with less than 3% organic matter. See replant restrictions. Terbacil will provide POST control of certain broadleaf weeds, however susceptible species need to be less than 2" tall.

**COMMERCIAL BLACKBERRY AND RASPBERRY WEED CONTROL**

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
<b>POSTEMERGENCE</b>					
<i>carfentrazone</i> Aim EC 2.0EC Aim EW 1.9EW		0.5-6.4 fl oz	0.008-0.1		Apply as a post-directed spray for primocane and weeds including morningglory, pigweed, and spiderwort. Aim at 1-2 fl oz provides control of most sensitive annuals. For primocanes, apply when 6" in height as a directed application of 6.4 fl oz/A in a minimum of 20 gal of spray at intervals of 14-21 days. Direct the spray at the bottom 18" of the canes and also to contact the soil out to 24" from each side of the plant row. Coverage is essential for weed control. Add a crop oil concentrate at 1 gal/100 gal of spray mix.
<i>paraquat</i> Various trade names and formulations are available		1.3-4 pt (varies by formulation, check label)	0.25-1 (varies with formulation, check label)		Use for broad spectrum, contact control of emerged weeds. Apply as a high volume (50 gpa), coarse directed spray with 1 qt surfactant/100 gal of spray solution. Avoid drift. Apply before emergence of new canes or shoots to minimize potential for plant injury. May be tank mixed with certain preemergence herbicides to provide postemergence and residual weed control. Contact with new growth will cause injury.
<b>POSTEMERGENCE GRASS CONTROL</b>					
<i>clethodim</i> SelectMax 0.97EC Intensity One		12-16 fl oz	0.094-0.121	PHI 7 D	Controls annual and perennial grasses. Use higher rates and sequential applications for perennial grasses. 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 nutsedge. <b>Select Max has 7 day PHI for caneberry.</b> Unless otherwise noted on the label, all other clethodim formulations are for non-bearing caneberry.
<i>fluzazifop</i> Fusilade DX 2L		16-24 fl oz	0.25-0.38		Use for control of annual and perennial grasses under <b>NON-BEARING</b> plants (harvest not expected within 1 year). Sequential applications will be necessary for controlling perennial grass weeds. 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 nutsedge.
<i>sethoxydim</i> Poast 1.5EC		1-2.5 pt	0.18-0.47	PHI 45 D	Use for control of annual and perennial grasses. Sequential applications will be necessary for control of perennial grass weeds. <b>May be used on bearing raspberries or blackberries, but not within 45 days of harvest.</b> 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. Spray volumes in excess of 25 gpa may reduce herbicide activity. The addition of crop oil concentrate, Dash, or methylated seed oil is necessary for optimum herbicide performance.

<sup>1</sup> All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5-1" of water). If no rain event occurs and no supplemental overhead watering is provided after a preemergent herbicide application, weed control may be extremely poor.

<sup>2</sup> Most preemergent herbicides will only control germinating weed seed. Generally, preemergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most preemergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).

<sup>3</sup> As long as the treated area remains undisturbed, most pre-emergent herbicides will provide weed control for 2-4 months in most growing mediums (in Georgia).

# COMMERCIAL BLUEBERRY WEED CONTROL

Mark A. Czarnota, Extension Horticulture – Weed Science

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
<b>PREPLANT</b>					
<i>glyphosate</i> Various trade names and formulations available	G9	See label	See label	4-12H/ 14 D	Apply to emerged weeds before transplanting. Perennial weeds may require higher rates of glyphosate (ie 4 lb ai/A). Some formulations of glyphosate may require the addition of an adjuvant.
<b>PREEMERGENCE <sup>1,2,3</sup></b>					
<i>dichlobenil</i> Casoron 4G		100 lb	4-6	12 H/ 35 D	Apply in early winter to plants that have been established 1 year or more. Use from mid-November to mid- February. Good product for controlling non-seed bearing plants (i.e. Bracken fern ( <i>Pteridium aquilinum</i> ), winter annuals, and Florida betony ( <i>Stachys floridana</i> ). After application, Casoron must be watered in with 0.5-1” irrigation event.
<i>diuron</i> Direx 4L Karmex 80DF Various generic formulations	C2	1.2-1.6 qt 1.5-2	1.2-1.6	12 H/ 0 D	Use for residual control of annual broadleaf weeds ONLY under plants established in the field for at least 1 year. Apply in late fall or early spring before weeds emerge. If small weeds are present apply with a surfactant or crop oil to improve contact activity. A repeat treatment may be made after harvest. DO NOT use on sand, loamy sand, gravelly soils, or on exposed subsoils.
<i>flumioxazin</i> Chateau 51WDG	E14	6-12 oz/A	0.375-0.75	12 H/ 60 D	Excellent herbicide for preemergence weed control. Use 10-12 oz rate for extended control (3 plus months). Controls a wide array of annual broadleaf and grass weeds (some early postemergent activity).
<i>hexazinone</i> Velpar 80DF	C1	1.3-2.6 lb	1-2	24 H/ 90 D	Apply as directed spray to soil and weeds before blueberry leaf emergence in plantings established for 3 years or more. DO NOT apply within 90 days of harvesting highbush blueberries or within 450 days of harvesting lowbush blueberries.
<i>mesotrione</i> Callisto 4L	F2	3-6 oz	0.094-0.19	12 H/ 14 D	May be applied pre or post bloom, direct to the base of the plant. Apply either a single 6 oz application or two 3 oz split applications can be made. Split applications must be 14 days apart. If early postemergence weed control is desired, it is recommended that crop oil concentrate be added to the spray solution (1% v/v). Temporary bleaching or chlorosis may occur to blueberry foliage.
<i>napropamide</i> Devrinol 50WDG Devrinol 10G	K3	8 lb 40 lb	4 4	12 H/ 90 D	Use for control of annual grasses and small seeded broadleaf weeds. Rainfall or overhead irrigation is needed within 24 hours of application (irrigation within 48 hours with the XT formulations). Apply as a directed spray to base of plants. May be used on first-year plantings. NOTE: Use only half this rate the first year if root cuttings are planted.
<i>norflurazon</i> Solicam 80WDG	F1	2.5-5 lb	2-4	12 H/ 30 D	Provides excellent preemergence control of annual grasses and some broadleaf weeds. Can also provide suppression of some perennials. Apply as a directed spray in the fall or early spring when dormant – fall applications control a broader weed spectrum than spring applications. DO NOT apply to blueberry plants established less than 6 months. Use the low rate on coarse textured soils; higher rates on fine textured soils. Make only 1 application per year. DO NOT use on nursery stock. Temporary bleaching or chlorosis may occur. DO NOT apply within 60 days of harvest.
<i>oryzalin</i> Surflan 4AS Oryzalin 4AS Surflan 85 DF		2-6 qt 2.4-7.1 lb	2-6	24 H/ 0 D	Controls annual grasses and small seeded annual broadleaf weeds. Use low rate for short-term control (1-2 months); high rate for long-term control (2-3 months). DO NOT apply to newly established plantings until the soil has settled and no cracks are present. Apply before annual weeds emerge or add Gramoxone or glyphosate for control of emerged weeds. Benefits highly from a tank mix partner like Simazine or Trellis. Do not apply when fruit is present.

**COMMERCIAL BLUEBERRY WEED CONTROL**

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
<b>PREEMERGENCE <sup>1,2,3</sup> (continued)</b>					
<i>oryzalin</i> Surflan 4AS Oryzalin 4AS + <i>simazine</i> Princep 4L, 90WDG		2-4 qt  + 2.2 lb 2 qt	2-4  + 2		Use for broad spectrum annual grass and broadleaf weed control. Especially useful on plantings less than 6 months old, use 1 lb ai/A of simazine. DO NOT apply when fruit is present. DO NOT use on gravelly, sand, or loamy sand soils.
<i>oryzalin</i> Surflan 4 AS Oryzalin 4 AS + <i>isoxaben</i> Gallery T/V Trellis		2-4 qt  + 0.66-1.33 lb/A	2-4  + 2		USE ON NON-BEARING PLANTS ONLY. Provides excellent preemergent weed control of many small seeded broadleaf weeds. Especially useful on plantings less than 6 months old, and if worried about damage from simazine.
<i>pronamide</i> Kerb 50W	K1	2-4 lb	1-2	24 H/ 2 D	Apply as a single directed spray in established blueberries only for early postemergence control of susceptible winter annual weeds, perennial grasses, and chickweed and for preemergence control of these and many other weeds. DO NOT APPLY ON NEW PLANTINGS UNTIL ESTABLISHED. DO NOT exceed 4 lb/A/year. Apply in late fall or winter when soil temperature is 55°F or less.
<i>rimsulfuron</i>	B2	4 oz	0.25 lb	4 H/ 14 D	Better as a pre-herbicide, but can provide post control of many weeds after germination and to difficult weeds such as yellow and purple nutsedge ( <i>Cyperus esculentus</i> and <i>C. rotundus</i> ). Can be applied 2 times a year, 30 days between application, no more than 4oz product in a calendar year. DO NOT apply 21 days before harvest or to soil classified as sand.
<i>simazine</i> Princep, Simazine 90DG Princep, Simazine 4F and other generic formulations	C1	2.2-4.4 lb 2-4 qt	2-4	12 H/ 14 D	Use for control of annual broadleaf weeds and some annual grasses. A tank mix partner will enhance spectrum of weed control (i.e. norflurazon, oryzalin). Two quarts of Surflan and Princep is an excellent application for recent or young plantings and should give at least 8 weeks of residual weed control. DO NOT apply when fruit is present.
<i>sulfentrazone</i> Zeus 4L	E14	6-12 oz	0.1875-0.375	12 H/ 15 D	Excellent preemergence weed control (8-12 weeks) that rivals Chateau (flumioxazin), but with the ability to control yellow nutsedge ( <i>Cyperus esculentus</i> ) without the damage of Sedgehammer (halosulfuron).
<i>terbacil</i> Sinbar 80WDG	C1	0.5-3 lb	0.4-2.4	12 H/ 90 D	Use for broad spectrum annual weed control ONLY under plants established in the field for at least 1 year. Apply a single application in spring or after harvest in the fall before weeds emerge or after weeds emerge but are less than 2" tall. DO NOT use on sand, loamy sand, or gravelly soils with less than 3% organic matter or plant damage can occur. Apply to the ground beneath the bushes, avoiding contact of foliage and fruit. Recommend trying on small acreage, monitor 4-8 weeks for damage before using on large acreage.

**COMMERCIAL BLUEBERRY WEED CONTROL**

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
<b>PPREEMERGENCE HERBICIDES FOR CONTAINER PRODUCTION (BLUEBERRIES GROWN FOR PLANTS <sup>1,2,3</sup>)</b>					
If in South Georgia (south of Macon), it is recommend that you make herbicide applications 6 times a year. If a herbicide program is started in January, applications should be made every 2 months for the remainder of the year (Jan, Mar, May, July, Sept, and Nov). Plants should be well rooted at the time of first herbicide application.					
<i>benfen/oryzalin</i> XL 2G	K1	150 lb	3	24 H/ 1 Year	<b>USE ON NON-BEARING PLANTS ONLY.</b> No postemergent activity. Excellent product for containers and small in-ground operations. Controls a wide array of annual broadleaf and grass weeds.
<i>dithiopyr</i> Dimension 1SL Dimension 40WP	K1	2 qt/A 20 oz/A	0.5 0.5	12 H/ 1 Year	<b>USE ON NON-BEARING PLANTS ONLY.</b> Provides preemergent control of most annual grasses and small seed broadleaf weeds. Also provides early postemergent control of some annual grasses up to 3 tillers. Use on 1-year old plants.
<i>flumioxazin</i> Broadstar 0.25GR Chateau 51WDG	E14	150 lb/A 6-12 oz/A	0.375 0.375-0.75	12 H/ 1 Year	Excellent preemergence weed control. Use 10-12 oz rate for extended control (3 plus months). Broadstar is excellent for containers and small in-ground operations. Controls a wide array of annual broadleaf and grass weeds (some early postemergent activity).
<i>indaziflam</i> Marengo 0.622 lbs/gal 0.224 GR	L29	7.5-15 oz/A 100-200 lb pr/A	0.0387-0.0775 0.0224-0.0448	12 H/ 1 Year	Controls a wide range of annual weeds from seed in containerized blueberries. Provides 1 of the longest preemergence weed control windows of any preemergence herbicide. Do not apply more than 200 lb pr/A (granular) or 15 oz pr/A (liquid) in a 12-month period. Active ingredient is the same as Alion but liquid formulations (lbs/gal) are different. Irrigate treated containers with at least 0.5” of water after herbicide application. Avoid MARENGO applications when plants are breaking bud.
<i>isoxaben</i> Gallery T/V Trellis	L21	0.66-1.33 lb/A	0.5-1	12 H/ 1 Year	<b>USE ON NON-BEARING PLANTS ONLY.</b> Provides excellent preemergent weed control of many small seeded broadleaf weeds. Maximum of 4 lb/year. Needs a tank mix partner for annual grass control (i.e., oryzalin)
<i>isoxaben</i> + <i>trifluralin</i> + <i>oxyfluorfen</i> Showcase 2.5TG	L21 + K1 + E14	100-200 lb	0.25-0.5 + 2-4 + 0.25-0.5	24 H/ 1 Year	<b>USE ON NON-BEARING PLANTS ONLY.</b> Excellent product for containers and small in-ground operations. Controls a wide range of annual weeds. DO NOT apply to newly planted blueberries until the soil has firmly settled and no cracks are present. DO NOT apply to blueberries when foliage is wet. Apply 0.5-1” of irrigation water to Showcase-treated area if adequate rainfall is not received within 3 days of application. Repeat applications of 150 lbs or higher should not be made sooner than 60 days. DO NOT apply more than 600 lbs of Showcase per year.
<i>oxadiazon</i> Regalstar 2G	E14	100-200 lb/A	2-4	12 H/ 1 Year	<b>USE ON NON-BEARING PLANTS ONLY.</b> Provides good preemergent weed control on a large spectrum of grass and broadleaf weeds. Works well on many winter annuals (i.e., Bittercress, Oxalis, etc.). Excellent product for containers and small in-ground operations. Label recommends using on small acreage to confirm safety before large-scale use.
<i>trifluralin/isoxaben</i> Snapshot 2.5TG	K1, L21	150-200 lb	3.75-5	12 H/ 1 Year	<b>USE ON NON-BEARING PLANTS ONLY.</b> No postemergent activity. Excellent product for containers and small in-ground operations. Control a wide array of annual broadleaf and grass weeds.
<i>oxyfluorfen + prodiamine</i> Biathlon 2.75 GR		100 lb	2.75		Good herbicide for controlling a broad spectrum of annual grasses and broadleaf weeds from seed. Do not apply to wet foliage.

## COMMERCIAL BLUEBERRY WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
<b>POSTEMERGENCE HERBICIDES<sup>2</sup></b>					
<i>glufosinate</i> Rely 280 2.34L Cheetah 2.34L Reckon 280 2.34L	H10	3-5 qt 48-82 oz. 1.5-4 oz/gal	0.75-1.25	12 H/ 14 D	Good on annual and perennial weeds with shallow root systems. Provides only suppression of perennial type weeds such as yellow and purple nutsedge. <b>DO NOT</b> allow spray drift to contact desirable foliage or uncalled bark of young branches as damage will occur. <b>DO NOT</b> apply more than 12 qts/A/year of Rely. <b>DO NOT apply within 14 days of harvest or through any type of irrigation system.</b>
<i>glyphosate</i> Various trade names and formulations	G9	See label	See label	4-12 H/ 14 D	Use for broad spectrum control of emerged weeds, both annuals and perennials. Apply as a directed spray under bearing and non-bearing bushes. <b>DO NOT</b> allow spray to contact foliage or green bark. Refer to product label for rates to control specific weeds and postharvest restrictions. May be tank mixed with certain preemergence herbicides to provide postemergence and residual weed control. Blueberry growing in bark beds or other soil-less media are susceptible to glyphosate injury.
<b>POSTEMERGENCE (GRASS HERBICIDES)<sup>2</sup></b>					
<i>clethodim</i> SelectMax 0.97EC	A1	9-16 fl oz	0.068-0.121	24 H/ 14 D	Controls annual and perennial grasses in blackberries. Use higher rates and sequential applications for perennial grasses. Add non-ionic surfactant (1 qt/100 gal, or as label instructs). Make application to johnsongrass: 12-18" tall; bermudagrass: 3" tall or with 4-8" runners; annual grasses: 2-8" tall. Multiple applications will be required for difficult grasses. Does not control nutsedge. Can use up to 7 days of harvest. Maximum single application is 16 oz/A, and yearly maximum is 64 oz/A.
<i>fluazifop</i> Fusilade DX 2L	A1	16-24 fl oz	0.25-0.38	12 H/ 1 Year	Controls annual and perennial grasses in NON-BEARING PLANTINGS (harvest not expected within 1 year). Sequential applications will be necessary for perennial grass control. 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 in. tall. Does not control nutsedge.
<i>halosulfuron</i> Sanda 75DF Other formulations	B2	0.5-1 oz	0.375-0.75	12 H/ 14 D	Apply as a post-directed application to control yellow, purple, and many other sedge species. Can provide preemergence control of many weeds from seed (see label). Sedges are best controlled when treatments are applied to actively growing nutsedges (3 to 5 leaf stage). Contact with blueberry plant should be avoided. If repeat applications are necessary, wait 45 days. Blueberry plants should be actively growing, well established, and 12-18" tall. <b>DO NOT</b> apply more than 2 oz in a 12 month period. Post-harvest interval is 14 days.
<i>sethoxydim</i> Poast 1.5EC	A1	1.5-2.5 pt	0.18-0.47	12 H/ 45 D	Use for control of annual and perennial grasses in bearing blueberries. Sequential applications will be necessary for controlling perennial grass weeds like bermudagrass and johnsongrass. Low spray volumes (10 GPA) generally improve control. Add crop oil concentrate (1 qt/A). For annual grasses up to 6" tall, 1-1.5 pt/A should be adequate. For annual grasses taller than 6" and perennial grasses, use up to 2.5 pt/A. Do not use more than 5 pt/A/season and the last application must be made at least 30 days prior to harvest. Does not control nutsedge. If spot spraying, use a 1-1.5% solution.

<sup>1</sup> All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5-1" of water). If no rain event occurs and no supplemental overhead watering is provided after a preemergent herbicide application, weed control can be extremely poor.

<sup>2</sup> Most preemergent herbicides will only control germinating weed seed. Generally, preemergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most preemergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).

<sup>3</sup> As long as the treated area remains undisturbed, most pre-emergent herbicides will provide weed control for 2-4 months in most growing mediums (in Georgia).



# COMMERCIAL GRAPE (MUSCADINE AND BUNCH) WEED CONTROL

Wayne E. Mitchem, Extension Associate – Fruit Tree Weed Control

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
<b>PREEMERGENCE</b>					
<i>oryzalin</i> Surflan 4AS 4 lb/gal <i>oryzalin</i> 4 lb/gal		2-6 qt	2-6		Use for control of annual grasses and small seeded annual broadleaf weeds. Use low rate for short-term control (2-4 months); high rate for long-term control (6-8 months). <b>DO NOT</b> apply to newly established vines until soil has settled and no cracks are present. Apply before annual weeds emerge 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. Allow 2.5 months between applications.
<i>flumioxazin</i> Chateau 51WDG Tuscany 51 WDG		6-12 oz	0.19-0.38	60 D	Grapes established <2 years must be trellised and shielded with a non-porous wrap, grow tube, or waxed container. <b>DO NOT</b> apply after bloom unless hooded application equipment is used to prevent spray drift contact with crop foliage or fruit. Once vines (wine/juice grapes only) break dormancy it is recommended that Chateau not be applied with glyphosate. Apply with either glufosinate or paraquat for non-selective POST weed control after bud break. <b>DO NOT apply within 60 days of harvest.</b> Research indicates Chateau applied at 6-8 oz/A in the spring followed by another 6-8 oz/A in early summer is very effective. <b>DO NOT</b> use more than 6 oz/A/application to soils having >80% sand and/or gravel content when vines are less than 3 years old.
<i>simazine</i> Princep, Simazine 90DF Princep, Simazine 4L		2.2-4.4 lb 2-4 qt	2-4		Use for control of annual broadleaf weeds and some annual grasses only under plants established in the vineyard at least 3 years. Use low rate on coarse textured soils. <b>DO NOT</b> use on sand, loamy sand, or gravelly soils. May be tank mixed with Surflan for broad spectrum annual grass and broadleaf weed control. Add paraquat, glufosinate or glyphosate for control of emerged weeds. Tank mixing with oryzalin or Prowl H <sub>2</sub> O will improve PRE control of annual grass weeds.
<i>diuron</i> Karmex, Diuron 80DF		2-3 lb	1.5-2		Use for control of annual broadleaf weeds and some annual grasses only under plants established in the vineyard at least 3 years. Apply in the spring before annual weeds emerge. <b>DO NOT</b> use on sand, loamy sand, gravelly soils, or on exposed subsoils. <b>DO NOT</b> use on soils with less than 1% organic matter. Severe injury may occur if heavy rainfall or more than 1" of overhead irrigation water follows treatment. This risk is assumed by user. May be tank mixed with oryzalin or Solicam for broad spectrum annual grass and broadleaf weed control.
<i>norflurazon</i> Solicam 80DF		1.25-5 lb	1-4		Use for control of annual grasses, broadleaf weeds, and suppression of some perennials <u>only</u> under plants established in the vineyard at least 2 years. Apply in the fall or early spring prior to weed emergence—fall applications control a broader weed spectrum than spring applications. Use the low rate on sandy loam soils; higher rates on fine textured soils. <b>DO NOT</b> apply after bud break on sandy loam or coarser soils. Add paraquat, glufosinate or glyphosate for control of emerged weeds. <b>DO NOT apply within 60 days of harvest.</b> Loss of pigment in leaf veins will occur in coarse textured soils when applied within 3 months after bud break.
<i>oxyfluorfen</i> Goal 2XL					Apply <b>ONLY</b> to DORMANT plants that have vines on a trellis wire a minimum of 3 ft above the soil surface. Direct spray toward the base of the vine. Avoid direct plant contact. <b>DO NOT</b>
Galigan 2E		2-8 qt	0.5-2		apply during the growing season or bud swell stage of growth. May be used as a preemergence or postemergence treatment. Use the higher rates for preemergence applications. May be tank mixed with simazine, Devrinol, oryzalin, paraquat, or glyphosate. Refer to Goal label for information on rates for postemergence treatments and tank mixes.
Oxiflo 2EC 2 lb/gal					
Goal Tender 3EC 4 lb/gal		1-4 pt			

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<b>PREEMERGENCE (continued)</b>					
<i>sulfentrazone + carfentrazone</i> Zeus Prime XC		7.7-15.2 fl oz	0.19 + 02 to 0.37 + 04	3 D	Apply as a directed spray to vines that have been established 2 years or longer. Zeus provides control of yellow nutsedges (see label) as well as broadleaf and grass weeds. For optimum PRE control of annual grasses tank mix Zeus with oryzalin. If applying in a band and 50% or less of the vineyard is treated Zeus may be applied twice within a 12 month period. Allow <b>60 days</b> or more between applications. <b>Zeus has a 3 day PHI.</b> Tank mix with paraquat, glyphosate, or glufosinate for non-selective POST weed control.
<i>pendimethalin</i> Prowl H <sub>2</sub> O 4 lb/gal		2-6 qt	2-6		Use for control of annual grasses and small seeded broadleaf weeds. <b>DO NOT</b> apply to newly planted vines until the soil has settled and no cracks are present. Apply to dormant vines (new transplants and 1 year old vines). <b>DO NOT</b> apply to newly planted vineyards if buds have started to swell. Apply before annual weeds emerge in the spring. Rainfall or irrigation (at least 0.5") within 7 days of application is necessary for effective weed control. In bearing vineyards Prowl may be applied anytime after harvest, through winter, and in the spring. Use rate cannot exceed 6 qt/A/year. <b>Prowl H2O has a 90 day PHI.</b>
<i>oryzalin</i> Surflan 4AS 4 lb/gal oryzalin 4 lb/gal + <i>simazine</i> Princep, Simazine 90DF Princep, Simazine 4L		2-4 qt  +  2.2-4.4 lb 2-4 qt	2-4   2-4		Use for broadspectrum preemergence weed control in vineyards where plants have been established for 3 years.  <b>DO NOT</b> use on sandy, loamy sand, or gravelly soils. Tank mix with paraquat, glufosinate or glyphosate for control of emerged weeds.
<i>rimsulfuron</i> Matrix 25WG Pruvin 25WG Solida 25WG		4 oz	063		Rimsulfuron has PRE and POST activity on broadleaf and some grass weeds. For broad spectrum residual control Matrix should be tank mixed with oryzalin or diuron. It should be tank mixed with glyphosate, paraquat, or glufosinate for non-selective POST weed control. <b>DO NOT</b> treat vineyards established <1 year. Rainfall is necessary for activation. <b>DO NOT apply within 14 days of harvest.</b> Rimsulfuron may be applied as sequential applications so long as total use rate does not exceed 4 oz/A/year and application is made in a band that is <50% of the vineyard floor.
<b>POSTEMERGENCE</b>					
<i>paraquat</i> Firestorm Paraquat Concentrate Parazone 3 lb/gal		1.75-2.7 pt	0.6-0.9		Use for broad spectrum, contact control of emerged weeds. Apply as directed spray in high spray volume (20+ gpa) with 1 qt surfactant/100 gal of spray solution. Apply when weeds are succulent and 1-6" tall. <b>DO NOT</b> allow spray drift to contact foliage or green cane tissue, since 90 D damage may occur. May be tank mixed with certain preemergence herbicides for postemergence and residual weed control.
Gramoxone SL 2 lb/gal		2-4 pt			
<i>glufosinate</i> Reckon Rely 280SL Lifeline 2.34 lb/gal		48-82 oz	0.88-1.5		Use for broad-spectrum control of emerged weeds and grasses, both annuals and perennials. Apply as a directed spray on bearing and non-bearing vines in a high volume (20+ GPA) spray. Possesses contact and limited systemic activity, but does well on wild brambles and certain perennial grasses. <b>DO NOT</b> allow spray drift to contact foliage or green cane tissue, since severe damage may occur. May be tank mixed with certain preemergence herbicides for postemergence and residual weed control. Does not have soil residual activity. <b>DO NOT</b> make more than 3 applications/year.

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		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
<b>POSTEMERGENCE (continued)</b>					
<i>glyphosate</i> Various brands and formulations		See label for rate	0.75-2		Use for broad spectrum control of emerged weeds, both annuals and perennials. Apply as a directed spray, contacting only mature bark of the main trunk. <b>DO NOT</b> allow spray to contact foliage or green bark of vines. Use low rate for control of annual weeds less than 12" tall. Refer to label for rates to control specific perennial weeds. <b>Allow a minimum of 14 days between last application and harvest.</b> Some difficult to control perennial weeds may require higher rates. Refer to label for rate and application timing for certain perennial weeds. Applying glyphosate in spray volumes of 25 gal/A or less is recommended for optimum results. Generic glyphosate formulations may require surfactant. Tank mix with residual herbicides for postemergence and preemergence weed control. Reduced rates may be used to suppress the growth of perennial grass sod between rows. See label for details.
<i>clethodim</i> Select 2 lb/gal		6-8 oz	0.095-0.125		Use for control of annual and perennial grasses in NON-BEARING vines that will not be harvested within 1 year of application. Use higher rates for perennial grasses. The addition of a non-ionic surfactant containing at least 80% ai at 1 qt/100 gal of spray solution (0.25% v/v) is required for optimum results. Make application to johnsongrass: 12-18" tall; bermudagrass: 3" tall or with 4-8 runners; annual grasses: 2-8" tall. Does not control nutsedge. Sequential applications may be necessary to control perennial grass weeds.
Arrow					
Volunteer					
Select Max 1 lb/gal					
Intensity One 1 lb/gal		12-1 6 oz			
<i>fluazifop</i> Fusilade DX 2 lb/gal		1-1.5 pt	0.25-0.375		Use for POST control of annual and perennial grasses. Low spray volumes 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 nutsedge. Sequential applications may be necessary to control perennial grass weeds. <b>DO NOT apply within 50 days of harvest.</b>
<i>sethoxydim</i> Poast 1.5 lb/gal		1-1.5 pt	0.23-0.34		Use for control of annual and perennial grasses under BEARING and non-bearing vines. Low spray volumes (10 gpa) generally improve control. Add crop oil concentrate (1 qt/A). <b>DO NOT</b> use more than 5 pt/A/season and <b>the last application must be made at least 50 days prior to harvest.</b> Use lower rates on annual grasses up to 6" tall; higher rates on larger annual grasses and perennial grasses. Sequential applications may be necessary for control of perennial grass weeds. Does not control nutsedge.
<i>carfentrazone</i> Aim 2EC 2 lb/gal		1-2 oz	0.016-0.031		Apply using hooded application equipment designed to totally enclose spray pattern preventing spray deposition on green stems, leaf tissues, flowers, or fruit of the crop. Aim may be used alone or tank mixed with other herbicides. Aim controls cocklebur, pigweed, nightshade, velvetleaf, carpetweed, spreading dayflower, and tropical spiderwort. <b>DO NOT apply within 3 days of harvest.</b> Apply in a minimum spray volume of 20 GPA. 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). See label for tank mix instructions. <b>DO NOT</b> use on newly transplanted vines. See label for details regarding its use for sucker 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	<i>chlorpyrifos</i> 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 pre-pollination spray.
	Centric 40WG	4A	2-2.5 oz	12 H/ –	Note: Other imidacloprid formulations are available. Read labels carefully to find the proper rate.
	Provado 1.6F	4A	3.5 oz	12 H/ –	
	Trimax Pro	4A	1.3-2.6 oz	12 H/ –	
Spittlebugs	<i>imidacloprid</i> Trimax, Provado, many generics	4A	See label <i>Several formulations are available.</i>	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	<i>chlorpyrifos</i> 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/ –	
	<i>clothianadin</i> Belay	4A	3-6 oz	12 H/ –	
	<i>methoxyfenozide</i> + <i>spinetoram</i> Intrepid Edge		4-6.4 oz		
	<i>tolfenpyrad</i> Apta		17-27 oz		<b>DO NOT</b> apply more than 1 application. No more than 27 oz/A/season.

**COMMERCIAL PECAN INSECT CONTROL**

<b>PEST</b>	<b>PESTICIDE</b>	<b>MOA</b>	<b>AMOUNT PER ACRE</b>	<b>REI/PHI (Hours or Days)</b>	<b>TIMING AND REMARKS</b>
Mites	<i>abamectin</i> Agri-Mek SC and others	6	2.25-4.25 oz	12 H/ –	A non-ionic surfactant or horticultural oil <b>MUST</b> 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.
	Envidor 2SC	23	14-18 oz	12 H/ –	
	Portal	21A	2 pt	12 H/ –	
	<i>pyridaben</i> Nexter	21	5.2-10.67 oz	24 H/ –	Savey is an ovicide and should be tank-mixed with an adulticide. Zeal is primarily an ovicide/larvicide.
	Savey 50DF	10A	3-6 oz	12 H/ –	
	Zeal	10B	2-3 oz	12 H/ –	
Yellow Aphids	<b>FOLIAR APPLICATIONS</b>				<p>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, <b>DO NOT</b> treat yellow aphids if they are the only insect problem. Rely on beneficial insects to suppress early season populations.</p> <p>In prolonged dry periods, lower, chronic aphid populations may require treatment to prevent the build-up of unacceptable levels of honeydew and sooty mold. <b>WEEKLY SCOUTING IS VERY IMPORTANT IN TIMING APHID SPRAYS, ESPECIALLY IN LATE SEASON.</b> Rotate among classes of insecticides between treatments to avoid resistance development.</p> <p>It is suggested that pyrethroid materials (cypermethrin, bifenthrin, etc.) not be used, alone or in combination, in early- or mid-season applications.</p> <p>Many generic formulations of imidacloprid are available. Read label carefully for recommended rate. Imidacloprid alone may not control yellow and black-margined aphids.</p> <p>Admire can be applied through a drip irrigation system, as an emitter spot application, or as a shanked-in emitter adjacent application. <u>See label for complete details.</u> Apply Admire only to orchards where drip irrigation has been established for at least 5 years.</p> <p><b>DO NOT</b> apply more than 1 application of Apta, no more than 27 oz/A/season.</p>
	Assail 30SG	4A	2.5-9.6 oz	12 H/ –	
	<i>clothianidin</i> Belay	4A	3-6 fl oz	12 H/ –	
	<i>flonicamid</i> Beleaf, Carbine	9C	2-2.8 oz	12 H/ –	
	<i>flupyradifurone</i> Sivanto 200 SL	4D	7.0-10.5 oz	4 H/ 7 D	
	<i>imidacloprid</i> Provado, many generics	4A	See label	12 H/ –	
	<i>pymetrozine</i> Fulfill	9B	4 oz	12 H/ –	
	<i>pyridaben</i> Nexter	21	5.2-10.67 oz	24 H/ –	
	<i>sulfoxaflor</i> Closer	4C	1.5-2.75 oz	12 H/ 7 D	
	<i>thiamethoxam</i> Centric	4A	2-2.5 oz	12 H/ –	
	<i>tolfenpyrad</i> Apta	21A	17-27 oz	12 H/ –	
	<b>SYSTEMIC APPLICATIONS</b>				
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 <i>chlorpyrifos</i> 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	<i>chlorpyrifos</i> 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.  <b>DO NOT</b> apply more than 1 application, no more than 27 oz/A/season.
	<i>clothianadin</i> Belay	4A	3-6 oz	12 H/ –	
	Dimilin 2L	15	8-16 oz	12 H/ –	
	Intrepid 2F	18	4-8 oz	4 H/ –	
	<i>methoxyfenozide + spinetoram</i> Intrepid Edge	5 + 18	4-6.4 oz	4 H/ –	
	<i>tolfenpyrad</i> 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.  <b>NOTE:</b> 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	1A	4-5 qt	24 H/ –	
	Various pyrethroids				

## COMMERCIAL PECAN INSECT CONTROL

### 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 "ugapekans"). 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
<b>Bud Break</b> When first buds open.	Foliar disease	Fungicide + <i>chlorpyrifos</i> 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/ –	
		<i>methoxyfenozide</i> + <i>spinetoram</i> Intrepid Edge	5 & 18	4-6.4 oz	4 H/ –	
	Hickory shoot curculio	<i>chlorpyrifos</i> 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.
<b>Cover Sprays</b> Three weeks after bud-break spray and every 4-6 weeks as needed.	Foliar disease	Fungicide + <i>chlorpyrifos</i> Chlorphos, Lorsban	1B	See above + 1-2 pt	24 H/ –	Spray sufficient gallonage for thorough coverage.
	Pecan bud moth	<i>chlorpyrifos</i> 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. <b>DO NOT</b> apply more than 32 fl oz of Admire per acre per season as a soil application. <b>DO NOT</b> 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. <b>DO NOT</b> graze or feed cover crops.
Asana		–/ 21 D	<b>DO NOT</b> feed or graze livestock on treated orchard floors. <b>DO NOT</b> exceed 0.3 lb ai/A/season. <b>DO NOT</b> mix with fungicides containing triphenyltin hydroxide.
Assail	4A	12 H/ 14 D	<b>DO NOT</b> 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. <b>DO NOT</b> graze.
Carbaryl	1A	24 H/ 14 D	<b>DO NOT</b> apply more than a total of 15 qt/season.
Centric	4A	12 H/ 14 D	<b>DO NOT</b> 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	<b>DO NOT</b> graze livestock in treated groves.
Elast F			<b>DO NOT</b> apply after shucks open. <b>DO NOT</b> graze treated areas.
Enable		–/ 28 D	<b>DO NOT</b> apply after shuck split. <b>DO NOT</b> apply more than 48 oz/A. <b>DO NOT</b> graze treated areas.
Endosulfan			<b>DO NOT</b> apply after shuck split. <b>DO NOT</b> graze livestock in treated groves. <b>DO NOT</b> 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	<b>DO NOT</b> apply more than 0.3 lb ai/A/season or after shuck split. <b>DO NOT</b> graze or cut treated cover crops for feed.
Headline		–/ 14 D	<b>DO NOT</b> apply more than 28 fl oz/A/season.

**PECAN CHEMICALS: PRE-HARVEST INTERVALS AND OTHER RESTRICTIONS**

<b>CHEMICAL</b>	<b>MOA</b>	<b>REI/PHI (Hours or Days)</b>	<b>TIMING AND REMARKS</b>
Imidan		3 D/ 14 D	<b>DO NOT</b> graze livestock in treated groves.
Intrepid	18	18/ 14 D	<b>DO NOT</b> graze livestock in treated areas or feed cover crops grown in treated areas. <b>DO NOT</b> 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	<b>DO NOT</b> 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			<b>DO NOT</b> apply after shuck split. <b>DO NOT</b> graze livestock in treated areas or cut treated areas for feed. <b>DO NOT</b> apply more than 32 fl oz/A/season.
Provado	4A	12 H/ -	<b>DO NOT</b> apply more than 28 fl oz of Provado/A/year. <b>DO NOT</b> apply more than a total of 0.5 lb ai of Provado or Admire/A/season.
Quilt		-/ 45 D	<b>DO NOT</b> apply after shuck split. <b>DO NOT</b> graze livestock in treated areas or cut treated areas for feed. <b>DO NOT</b> apply more than 122 fl oz/A/season.
Savey	10A	12 H/ -	<b>DO NOT</b> graze livestock in treated areas. Only one application per season may be made.
Sovran		-/ 45 D	<b>DO NOT</b> apply more than 25.6 fl oz/A/season.
Stratego		-/ 30 D	<b>DO NOT</b> apply after shuck split. <b>DO NOT</b> apply more than 30 fl oz/A/season.
Sulfur			No time limitations.
TPTH			<b>DO NOT</b> use more than 45 oz (36 oz ai) of product per season. <b>DO NOT</b> apply after shucks begin to open. <b>DO NOT</b> graze dairy or meat animals in treated groves.
Topsin M			<b>DO NOT</b> apply after shuck split. <b>DO NOT</b> graze livestock in treated areas or cut treated areas for feed. <b>DO NOT</b> 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
<b>PREPOLLINATION APPLICATIONS: Every 10-14 Days From Bud Break Through Nut Set</b>					
Scab; Downy Spot	<i>azoxystrobin</i> Abound Azaka	11	6-12 fl oz	4 H/ 45 D	
	<i>difenoconazole + azoxystrobin</i> Quadris Top	3 + 11	10-14 fl oz	12 H/ 45 D	
	<i>dodine</i> Elast 400F + FRAC group 3 fungicide	U12 + 3	25 fl oz + half rate	48 H/ Do not apply after shuck split	<u>DO NOT</u> use Elast on Moore, Van Deman, Barton, or Shawnee.
	<i>dodine</i> Elast 400F + TPTH	U12 + 30	25 fl oz + half rate	48 H/ Do not apply after shuck split or within 30 D of harvest	<u>DO NOT</u> use any surfactant with Elast. <u>DO NOT</u> use Elast with foliar zinc treatments.
	<i>fenbuconazole</i> Enable 2F	3	8 fl oz	12 H/ Do not apply after shuck split or within 28 D of harvest	
	<i>kresoxim-methyl</i> Sovran	11	2.4-3.2 fl oz	12 H/ 45 D	
	<i>metconazole</i> Quash	3	2.5-3.5 oz/A	12 H/ 25 D	<u>DO NOT</u> make more than 4 applications per season.
	<i>phosphorous acid</i> 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. <u>DO NOT</u> 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.
	<i>phosphorous acid + tebuconazole</i> 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
<b>PREPOLLINATION APPLICATIONS: Every 10-14 Days From Bud Break Through Nut Set</b>					
Scab; Downy Spot <i>(continued)</i>	<i>propiconazole</i> 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.
	<i>propiconazole + azoxystrobin</i> 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.
	<i>pyraclostrobin</i> Headline	11	6-7 fl oz	12 H/ 14 D	
	<i>tebuconazole</i> 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. <b>DO NOT</b> add a surfactant if mixing with other fungicides.
	<i>tebuconazole + azoxystrobin</i> Custodia	3 + 11	8.6-17.2	12 H/ 45 D	
	<i>tebuconazole + trifloxystrobin</i> 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.
	<i>thiophanate methyl</i> <sup>3</sup> (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.
	<i>triphenyltin hydroxide</i> (TPTH) <sup>1</sup> + FRAC group 3 fungicide	30 + 3	half rate <sup>2</sup> + 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.				
<b>POSTPOLLINATION APPLICATIONS: Every 10-21 Days From Nut Set To Shell Hardening</b>					
Scab	<i>difenoconazole + azoxystrobin</i> Quadris Top	3 + 11	10-14 fl oz	2 H/ 45 D	
	<i>dodine</i> Elast 400F	U12	50 fl oz	48 H/ Do not apply after shuck split	
	<i>dodine</i> Elast 400F + FRAC group 3 fungicide <sup>3</sup>	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
<b>POSTPOLLINATION APPLICATIONS: Every 10-21 Days From Nut Set To Shell Hardening</b>					
Scab <i>(continued)</i>	<i>dodine</i> Elast 400F + TPTH	U12  30	25 fl oz + half rate <sup>2</sup>	48 H/ Do not apply after shuck split	<u>DO NOT</u> use any surfactant with Elast.
	<i>phosphorous acid</i> 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. <u>DO NOT</u> 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
	<i>phosphorous acid + tebuconazole</i> 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
	<i>propiconazole + azoxystrobin</i> 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	
	<i>tebuconazole<sup>4</sup> + trifloxystrobin</i> 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.
	<i>triphenyltin hydroxide (TPTH)<sup>1</sup></i> 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	
	<i>ziram</i> 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. <u>DO NOT</u> 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.

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

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

<sup>3</sup> 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.

<sup>4</sup> 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.

<b>After Shell Hardening:</b> Fungicide coverage for crop protection is necessary to shell hardening. Beginning in early August, monitor for shell hardening and adjust fungicide needs accordingly.					
<b>Foliar diseases:</b> 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. <u>DO NOT</u> 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		
	<i>phosphorous acid</i> 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		
	<i>copper hydroxide</i> 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		
<b>PREEMERGENCE</b>					
<i>oryzalin</i> 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). <u>DO NOT</u> 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.
<i>diuron</i> 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 <b>at least 3 years</b> . 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. <u>DO NOT</u> use on sand, loamy sand, gravelly soils, or on exposed subsoils. <u>DO NOT</u> use on soils with less than 0.5% organic matter. <u>DO NOT</u> graze treated areas. Add paraquat, glufosinate, or glyphosate for enhanced control of emerged weeds.
<i>simazine</i> 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 <b>at least 2 years</b> . Provides good control of annual ryegrass. Use low rates on sandy soils. <u>DO NOT</u> apply to gravelly, sand, or loamy sand soils. <u>DO NOT</u> apply when nuts are on the ground. <u>DO NOT</u> graze treated areas. Add paraquat, glufosinate, or glyphosate for control of emerged weeds.
<i>oryzalin</i> Surflan 4AS Oryzalin 4AS + <i>simazine</i> 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.
<i>norflurazon</i> Solicam 80DF + <i>diuron</i> 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.
<i>pendimethalin</i> Prowl H <sub>2</sub> O 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. <u>DO NOT</u> 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. <b>Prowl H<sub>2</sub>O has a 60 day PHI for pecans</b> ; 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		
<b>PREEMERGENCE</b>					
<i>norflurazon</i> 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. <b>DO NOT apply when nuts are on the ground at harvest.</b> Use low rate on coarse-textured soils, higher rates on fine-textured soils. Make only 1 application per year. <b>DO NOT</b> 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. <b>DO NOT apply within 60 days of harvest.</b> Sequential applications can be used so long as total use rate does not exceed maximum use rate for soil texture and crop.
<i>rimsulfuron</i> Matrix 25WG Solida 25WG Previn 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 <sub>2</sub> O. Use in orchards established at least 1 year. <b>Rimsulfuron has a 14 day PHI for pecan.</b> 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.
<i>flumioxazin</i> Chateau 51WDG Tuscany 51 WDG		6-12 oz	0.19-0.38		<b>DO NOT</b> 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. <b>DO NOT</b> 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. <b>Flumioxazin has a 60 day PHI for pecans.</b>
<i>indaziflam</i> 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. <b>Alion has a 14 day PHI.</b> Do not use on soils having a 20% or greater gravel content.
<b>POSTEMERGENCE</b>					
<i>2,4-D amine</i> Various generic formulations 3.8SL		2-3 pt	1-1.4		<b>DO NOT apply more than twice a year or within 60 days of harvest.</b> Trees must be at least 1 year old. <b>DO NOT</b> allow spray to drift onto or contact foliage, fruit, stems, or trunks of trees. <b>DO NOT</b> apply to bare ground. <b>DO NOT</b> 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		
<b>POSTEMERGENCE (continued)</b>					
<i>fluzifop</i> 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). <b>DO NOT apply when harvestable nuts are on the ground. DO NOT graze treated area. DO NOT apply within 30 days of harvest.</b>
<i>sethoxydim</i> 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. <b>DO NOT harvest within 15 days of application.</b>
<i>clethodim</i> Select 2.0EC		6-8 fl oz			Use for control of annual and perennial grasses in <b>NON-BEARING</b> 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			
<i>halosulfuron</i> Sanda 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. <b>DO NOT apply within 1 day of harvest.</b> See label for rate restrictions related to soil texture. Tank mix with glyphosate for broad spectrum control
<i>paraquat</i> 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. <b>DO NOT</b> allow spray drift to contact foliage or green bark of trees since severe damage may occur. <b>DO NOT</b> allow animals to graze on treated areas. May be tank mixed with certain preemergence herbicides for effective residual weed control. <b>DO NOT</b> apply when nuts are on the ground.
Gramoxone SL 2 lb/gal		2-4 pt			
<i>glufosinate</i> 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. <b>DO NOT</b> 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		
<b>POSTEMERGENCE (continued)</b>					
<i>glyphosate acid</i> 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. <b>DO NOT</b> 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. <b>DO NOT</b> allow glyphosate to contact bark or leaves. <u>Try to avoid applications in late summer and fall.</u> Trees are more sensitive to glyphosate during that time. <b>Allow at least 3 days between last application and harvest.</b>
<i>carfentrazone</i> 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. <b>DO NOT</b> allow Aim to contact desirable foliage, flowers, or fruit. <b>DO NOT apply within 3 days of harvest.</b> 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).
<b>ROW MIDDLE VEGETATION SUPPRESSION</b>					
<i>glyphosate acid</i> 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. <b>Allow a minimum of 21 days between the last application and harvest.</b>

# COMMERCIAL STRAWBERRY WEED CONTROL

Mark A. Czarnota, Extension Horticulture – Weed Science

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
<b>PREPLANT (plastic culture)</b>					
<i>carfentrazone</i> Aim EC 2EC Aim EW 1.9EW		0.8-1.5 fl oz	0.013-0.023		For annual broadleaf weeds including morningglory, pigweed, and spiderwort. Apply prior to planting or before crop emergence to weeds less than 3". Coverage is essential for weed control. Add a non-ionic surfactant at 1 qt/100 gal of spray mix.
<i>dazomet</i> Basamid 99GR		350 lb	347		For best results apply at soil temperatures of 54-64°F. DO NOT apply at soil temperatures less than 43°F or more than 103°F. Uniformly apply granules to freshly tilled, moist soil with a suitable granular applicator. Activity is reduced at low soil temperatures and at low soil moisture levels. After application seal the soil by watering or by tarp (refer to Basamid label). Aerate soil by cultivation 7-12 days after application. After aeration delay planting 3-7 days, depending on soil temperature, to ensure that no gaseous residues are present. A germination test with radish seeds can be conducted to ensure that harmful residues are not present (see label). DO NOT apply within 3-4 ft of growing plants or closer than the dripline of trees.
<i>Other fumigation options</i>					The fumigant methyl bromide is being phased out and other fumigates are being researched for strawberries, including chloropicrin, and combinations with chloropicrin and others. For the latest information on fumigants for strawberries check with University of California or University of Florida agricultural publications. Both of these universities have very active research programs in this area.
<b>PREEMERGENCE<sup>1,2,3</sup> (plastic culture)</b>					
<i>acifluorfen</i> Ultra Blazer 2 L		1.5 pt	0.375	PHI 60 D	Provides control of many difficult annual weeds from seed (i.e. palmer amaranth and cutleaf evening primrose). For annual strawberries, make 1 application before laying plastic. Can also be applied in allies between plastic with shielded sprayers to prevent drift to strawberry plants. For perennial strawberries, 2 applications can be made: One application after last harvest and 1 application when plants are dormant in late winter/early spring. Maximum seasonal application rate is 1.5 pt/A. Postharvest interval is 60 days.
<i>DCPA</i> Dacthal W-75		8-12 lb	6-9		Control of most annual grasses and small-seeded broadleaf weeds. Also, controls volunteer small grains if applied before emergence. Apply as a banded preemergence treatment to the middles between plastic before weed emergence. A tank mixture with paraquat will provide pre- and post-emergence weed control. Rainfall or irrigation within 24 hr after application is needed for optimum control.
<i>flumioxazin</i> Chateau 51WDG		3 oz/A	0.09		Excellent product for preemergence weed control. Use 3 oz rate to control weeds in row middles. Must be applied a minimum of 30 days prior to transplanting strawberries into plastic. <b>Do not apply more than 3 oz/A/year.</b>
<i>napropamide</i> Devrinol 50DF		4-8 lb	2-4 lb		For row middle and pre-transplant incorporation. Controls annual grasses and annual broadleaf weeds. Mechanically incorporate or irrigate in to a depth of 2-4". Does not control established weeds. <b>DO NOT apply from bloom to harvest.</b>
<i>oxyfluorfen</i> Goal 2XL		1-2 pt	0.25-0.5		Prior to transplanting crop, apply to soil surface of pre-formed beds for broadleaf weed control. Results are best when plastic mulch is applied immediately after application. Do not incorporate for maximum activity; however, to reduce the potential for crop injury incorporate in beds to a depth of 2.5" prior to transplant. DO NOT transplant within 30 days of application.

## COMMERCIAL STRAWBERRY WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
<b>PREEMERGENCE<sup>1,2,3</sup> (plastic culture) (continued)</b>					
<i>sulfentrazone</i> Zeus 4 L		3-6 oz	0.094-0.1885		For annual strawberries, apply to soil surface before laying plastic mulch ( <b>DO NOT</b> apply over plastic mulch). For perennial strawberries, applications can be applied to dormant strawberries. Zeus can be applied to row middles with hooded sprayer. Do not allow spray to contact strawberry foliage. Provides excellent control of most annual weeds from seed (good on Morningglory species). Also provides good control of yellow nutsedge ( <i>Cyperus esculentus</i> ) and some control of purple nutsedge. <b>DO NOT</b> exceed 12 oz pr/A in a growing season.
<i>terbacil</i> Sinbar 80 WDG		2-4 oz	1.6-3.2		Can provide excellent weed control of annual weeds from seed, but undesirable damage can occur to strawberry plants grown in Georgia soils with organic matter levels less than 1%. If organic matter is more than 1% Sinbar can be used in annual strawberries before plastic is laid (4 oz pr/A), and in perennial mat berries at 2-3 oz pr/A (apply after strawberries are set, but before runner growth). Would recommend experience with product before using on large acreage.
<b>POSTEMERGENCE (Plastic Culture)</b>					
<i>carfentrazone</i> Aim EC 2.0 EC Aim EW 1.9 EW		2 fl oz	0.031		For burndown of weeds in plasticulture allies. Good at controlling difficult weeds such as morningglory, pigweed, and spiderwort. Weeds should be less than 4" tall. Coverage is essential for weed control. Add a non-ionic surfactant at 0.25% V/V (2 qt/100 gal of spray mix).
<i>clethodim</i> Select Max 2EC		6-8 fl oz	0.094-0.125	PHI 4 D	Apply postemergence for annual grasses at 6-8 oz/A, or for bermudagrass and johnsongrass, at 8 oz/A. Add 1 gal crop oil concentrate per 100 gal spray mix. Very effective in controlling annual bluegrass. Apply to actively growing grasses not under drought stress. <b>DO NOT apply within 4 days of harvest.</b>
<i>clopyralid</i> Stinger 3 lb/gal		5.3 fl oz	0.124	PHI 30 D	<b>DO NOT</b> use a surfactant. <b>DO NOT</b> tank mix with other herbicides. <b>DO NOT apply within 30 days of harvest.</b> Make 1-2 applications/year not to exceed 10.6 fl oz/A/year. Make only 1 application in the spring. Minor leaf cupping may occur. Do not use if unwilling to accept minor crop injury. Limited research by the University of Georgia has been conducted. Suggest using on minimal acreage initially. Stinger is effective on weeds in the aster (cocklebur, dandelion, ragweeds, thistle, etc.), legume (clover, vetch, etc.), and nightshade (eastern blacknightshade) families.
<i>paraquat</i> Gramoxone 2.0 SL Other formulations		2 pt/A	0.5	PHI 21 D	For burndown of weeds in plasticulture allies. <b>DO NOT</b> apply more than 3 times/year (6 pts/season). Post-harvest interval is 21 days. Coverage is essential for weed control. <b>DO NOT</b> allow spray drift to contract strawberry plants. Add a non-ionic surfactant at 0.25% V/V (2 qt/100 gal of spray mix).
<i>sethoxydim</i> Poast 1.5EC		1.5-2.5 pt	0.18-0.47	PHI 7 D	Use for control of emerged annual and perennial grasses. Apply to actively growing grasses <b>at least 7 days prior to harvest.</b> Low spray volumes (10 GPA) generally improve control. Add crop oil or adjuvant containing crop oil at product's recommended rate. Use low rate on annual grasses up to 6" tall; higher rates on larger annual grasses and perennial grasses. Repeat applications may be made but the total amount applied should not exceed 2.5 pt/season. <b>DO NOT</b> cultivate 5 days prior to or 7 days after application. Reduced rates (4-6 oz/A) may be used to suppress ryegrass growth in the row middles; however, environmental conditions and ryegrass size greatly affect results.

<sup>1</sup> All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5-1" of water). If no rain event occurs and no supplemental overhead watering is provided after a preemergent herbicide application, weed control can be extremely poor.

<sup>2</sup> Most preemergent herbicides will only control germinating weed seed. Generally, preemergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most preemergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).

<sup>3</sup> As long as the treated area remains undisturbed, most pre-emergent herbicides will provide weed control for 2-4 months in most growing mediums (in Georgia).

## COMMERCIAL STRAWBERRY WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
<b>POSTEMERGENCE HOODED OR SHIELDED APPLICATIONS (plastic culture)</b>					
<i>carfentrazone</i> Aim EC 2EC Aim EW 1.9EW		0.5-1.6 fl oz	0.008-0.025		For control of annual broadleaf weeds including morningglory, pigweed, and spiderwort. Apply as a hooded spray in row middles. <b>DO NOT</b> allow herbicide to contact the crop. Apply to weeds less than 3". Coverage is essential for weed control. Add a non-ionic surfactant or adjuvant containing surfactant at products recommended rate. May mix with glyphosate.
<i>flumioxazin</i> Chateau 51WDG		3 oz/A	0.09		Excellent preemergence weed control product. Use a 3 oz rate for pre-transplants or pre-emergence to dormant strawberries. Can also use 3 oz rate on row middles, with a shielded sprayer, before fruit set. <b>DO NOT apply more than 3 oz/A/year.</b>
<i>paraquat</i> Gramoxone Inteon 2SL		2 pt	0.62	PHI 21 D	Contact kill of emerged broadleaf and grass weeds, using shields and direct spray to row middles to <b>prevent contact with strawberry foliage.</b> Use a nonionic surfactant at 1-2 pt/100 gal spray mix or 1 gal approved crop oil concentrate/100 gal spray mix. Use a minimum of 20 GPA of water. <b>DO NOT apply Gramoxone within 21 days of harvest.</b> DO NOT make more than 3 applications per season. DO NOT graze livestock in treated areas.
<i>glyphosate</i> Various trade names and formulations		See label.	See label.		Apply as a hooded or shielded spray in row middles, as a wiper application in rows, or apply post harvest. To prevent severe injury to crop, <b>DO NOT</b> let herbicide contact foliage, green shoots or stems, exposed roots, or fruit of crop. May make 3 applications per year.
<b>PREEMERGENCE<sup>1,2,3</sup> (matted row)</b>					
<i>carfentrazone</i> Aim EC 2.0EC Aim EW 1.9EW		0.8-1.5 fl oz	0.013-0.023		For annual broadleaf weeds including morningglory, pigweed, and spiderwort. Apply prior to planting or before crop emergence to weeds less than 3". Coverage is essential for weed control. Add a non-ionic surfactant at 1 qt/100 gal of spray mix.
DCPA Dacthal W-75		8-12 lb	6-9		For control of most annual grasses and small-seeded broadleaf weeds. Apply over-the-top of newly planted transplants in fall or early spring for preemergence weed control. <b>DO NOT apply after first bloom through harvest.</b>
<i>flumioxazin</i> Chateau 51WDG		3.0 oz	0.09		Excellent product for preemergence weed control. Apply 3 oz rate 30 days prior to transplanting strawberries. A crop oil at 1% v/v or a non-ionic surfactant at 0.25% v/v can be added to help provide early postemergence weed control. <b>DO NOT apply more than 3 oz/A/year.</b>
<i>napropamide</i> Devrinol 50DF		4-8 lb	2-4		For control of most annual grasses and small-seeded broadleaf weeds. Delay application until desired number of daughter plants have become established. <b>DO NOT apply from bloom through harvest.</b> Irrigation or mechanical incorporation is essential for activation.
<i>clethodim</i> Select 2EC		6-8 fl oz	0.09-0.125	PHI 4 D	Postemergence grass control. Very effective in controlling annual bluegrass. Add 1% crop oil concentrate to all sprays (1 gal of crop oil concentrate/100 gallons of spray). <b>DO NOT apply within 4 days of harvest</b> and <b>DO NOT</b> apply more than 8 oz per application.
<i>clethodim</i> Select Max 0.97EC		9-16 fl oz	0.068-0.121		Controls annual and perennial grasses in NON-BEARING PLANTINGS (harvest not expected within 1 year). Sequential applications will be necessary for control of most perennial grasses. Use 10-40 GPA. Add crop oil concentrate to the spray solution (1% v/v but no less than 1 pt/A).

<sup>1</sup> All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5-1" of water). If no rain event occurs and no supplemental overhead watering is provided after a preemergent herbicide application, weed control can be extremely poor.

<sup>2</sup> Most preemergent herbicides will only control germinating weed seed. Generally, preemergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most preemergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).

<sup>3</sup> As long as the treated area remains undisturbed, most pre-emergent herbicides will provide weed control for 2-4 months in most growing mediums (in Georgia).

## COMMERCIAL STRAWBERRY WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
<b>POSTEMERGENCE (matted row)</b>					
<i>clopyralid</i> Stinger 3 lb/gal		5.3 fl oz	0.124	PHI 30 D	<p><b>DO NOT</b> use a surfactant. <b>DO NOT</b> tank mix with other herbicides. <b>DO NOT</b> apply within 30 days of harvest.</p> <p>Make 1-2 applications per year not to exceed 10.6 fl oz/A/year. Make only 1 application in the spring.</p> <p>Minor leaf cupping may occur. Do not use if unwilling to accept minor crop injury. Limited research by the University of Georgia has been conducted. Suggest using on minimal acreage initially. Stinger is effective on weeds in the aster (cocklebur, dandelion, ragweeds, thistle, etc.), legume (clover, vetch, etc.), and nightshade (eastern blacknightshade) families.</p>
		5.3-10.6 fl oz	0.248		
<i>fluazifop-p</i> Fusilade DX 2EC		16-24 fl oz	0.25-0.38	PHI 1 Year	<b>USE ON NONBEARING CROP ONLY.</b> Postemergence grass control. The addition of either a crop oil or nonionic surfactant will be necessary. <b>DO NOT</b> apply within 1 year of the first harvest.
<i>sethoxydim</i> Poast 1.5EC		1.5-2.5 pt	0.18-0.47	PHI 7 D	Postemergence grass control. Consult label for specific rates and best times to treat. Add 1 qt of crop oil concentrate per acre. <b>DO NOT</b> apply on days that are unusually hot and humid. <b>DO NOT apply within 7 days of harvest.</b>
<b>POSTEMERGENCE HOODED OR SHIELDED APPLICATIONS (matted row)</b>					
<i>carfentrazone</i> Aim EC 2EC Aim EW 1.9EW		0.5-1.6 fl oz	0.008-0.025		For control of annual broadleaf weeds including morningglory, pigweed, and spiderwort. Apply as a hooded spray in row middles. <b>DO NOT</b> allow herbicide to contact the crop. Apply to weeds less than 3". Coverage is essential for weed control. Add a non-ionic surfactant at 1 qt/100 gal of spray mix. May mix with glyphosate.
<i>glyphosate</i> Various trade names and formulations		See label.	See label.		Apply as a hooded or shielded spray in row middles, as a wiper application in row middles, or apply post harvest. To prevent severe injury to crop, <b>DO NOT</b> let herbicide contact foliage, green shoots or stems, exposed roots, or fruit of crop.
<i>paraquat</i> Gramoxone Inteon 2SL Other formulations		2 pt	0.62	PHI 21 D	Contact kill of emerged broadleaf and grass weeds using shields and direct spray between the rows to <b>prevent contact with strawberry foliage.</b> Use a nonionic surfactant at 1-2 pt/100 gal spray mix or 1 gal approved crop oil concentrate per 100 gal spray mix. Use a minimum of 20 GPA of water. <b>DO NOT apply Gramoxone within 21 days of harvest . DO NOT</b> make more than 3 applications per season. <b>DO NOT</b> graze livestock in treated areas.

<sup>1</sup> All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5-1" of water). If no rain event occurs and no supplemental overhead watering is provided after a preemergent herbicide application, weed control can be extremely poor.

<sup>2</sup> Most preemergent herbicides will only control germinating weed seed. Generally, preemergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most preemergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).

<sup>3</sup> As long as the treated area remains undisturbed, most pre-emergent herbicides will provide weed control for 2-4 months in most growing mediums (in Georgia).

# WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS

Wayne E. Mitchem, Extension Weed Scientist

	Alion		Diuron, etc.		Devrinol		Solicam		Sinbar		Prowl		Oryzalin		Simazine		Trellis	
Application Method <sup>1</sup>	PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE	
Time of Year <sup>2</sup>	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
<b>BIENNIAL AND PERENNIAL WEEDS</b>																		
asters			F	G	P				F	G	P	P	P	P		G		G
bahiagrass			P	P	P	P	P		P-F	P-F	P	P	P	P	P	P	P	P
bermudagrass			P	P	P	P	F	F	F	P	P	P	F	F	P	P	P	P
briars			P	P	P	P	P	F	P	P	P	P	P	P	P	P	P	P
camphorweed					P			G	F		P	P	P	P		G	P	P
dallisgrass			P	P	P	P	F		P-F	P-F	P	P	P	P	P	P	P	P
dogfennel			P	F	P	P		E	G	G	P	P		P	P	F	G	G
horsenettle			P-F	P	P	P	P	P	F	P	P	P	P	P	P	P-F	P	P
johnsongrass			P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
nutsedge			P	P	P	P	P-F		P-F	P-F	P	P	P	P	P	P	P	P
plantains						G		G		F	P	P	P	P	P	G	G	G
wild garlic/onion			P	P	P			G			P	P	P	P	P	P	P	P
<b>ANNUAL GRASSES</b>																		
barnyardgrass			G		E		G		G		G		G		G		P	P
crabgrass	E		G		E		G-E		G		E		E		G		P	P
crowfootgrass			G		E		G		G		E		E		G		P	P
fall panicum	G		F		G		E		G		G		G		G		P	P
goosegrass	E		G		G		E		G		E		E		G		P	P
johnsongrass (seedling)			F		E		G		G		G		G		P		P	P
ryegrass, annual		G		G		F				F		F		F-G		G-E	P	P
sandbur			G		E		G		G		G		E		G		P	P
signalgrass, broadleaf	G		G		G		G		G		E		G		P		P	P
Texas panicum	G		P		G		F		F		G		G		F		P	P

Key to Response Symbols:  
 E – Excellent Control  
 G – Good Control  
 F – Fair Control  
 P – Poor Control

<sup>1</sup> PRE – Preemergence.  
<sup>2</sup> S – Spring; F – Fall.

If no symbol is given, weed does not occur in specific season (spring or fall) or weed response is unknown.

**WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS**

	Alion		Diuron, etc.		Devrinol		Solicam		Sinbar		Prowl		Surflan		Princep, etc.		Trellis	
Application Method <sup>1</sup>	PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE	
Time of Year <sup>2</sup>	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
<b>ANNUAL BROADLEAF WEEDS</b>																		
bristly starbur			G		P		F		E		P		P		F		P	P
chickweed	E		G	G		E	E	E		E		G		G		G		G
cocklebur	G		G		P		F		G		P		P		F		P	P
crotalaria			G		P				G		P		P				P	P
croton, tropic	G		G		P		E		G		P		P		F-G		P	P
evening primrose	E			G	F	G			F	G	P		P			G-E		G
Florida beggarweed			G		F		G		E		P		P		G		P	P
Florida pusley			G		E		G		E		G		G		G		F	F
horseweed	G	G	F	G	P	F	G	G	G	G	P	P	P	P	P	G		G
jimson weed	G		G		P		G		E		P		F		F-G		G	
lambsquarters	E		E		E		F		E		E		E		E		E	
morningglories	G		G		P		F-G		G-E		P		F		F-G		F	
pigweed	E		G		G		F		E		G		G		F-G		E	
prickly lettuce				G		E	G			E	P	P	P	P	G	E		G
prickly sida (teaweed)	E		G		P		G-E		E		P		P		F-G		G	
purslane, common	E		E		E		E		E		E		E		E		E	
ragweed, common	E		E		F		G		E		P		P		G		E	
sicklepod			G		P		F		E		P		P-F		F-G			
wild radish			F-G	G	F	G	F	G	E	E	P	P	P	P	G	E		E

Key to Response Symbols:  
 E – Excellent Control  
 G – Good Control  
 F – Fair Control  
 P – Poor Control

<sup>1</sup> PRE – Preemergence.  
<sup>2</sup> S – Spring; F – Fall.

If no symbol is given, weed does not occur in specific season (spring or fall) or weed response is unknown.



**WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS**

	Chateau		ZEUS		Oxyfluorfen		Fusilade Clethodim <sup>+</sup>		Glyphosate		Paraquat		2,4-Damine		Poast	
Application Method <sup>1</sup>	PRE		PRE		PRE		PDS		PDS		PDS		PDS		PDS	
Time of Year <sup>2</sup>	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
<b>BIENNIAL AND PERENNIAL WEEDS</b>																
asters			G		F	F	P	P	G	E	F	F	F		P	P
bahiagrass	P	P	P		P	P	F	P	F	F	F	F	P	P	F	P
bermudagrass	P	P	P		P	P	G	F	F	G	F	P	P	P	G	P-F
briars	P	P			P	P	P	P	P-F	G-E	P	P	F	F	P	P
camphorweed	P	P				G	P	P	G		F				P	P
dallisgrass	P	P	P		P	P	F	F	G	G	F	P	P	P	P	P
dogfennel	P	P					P	P	G	G	F	P			P	P
horsenettle	F	P			P	P	P	P	F	G	P	P	F		P	P
johnsongrass	P	P	P		P	P	G	P	F	G	F	P	P	P	G	F
nutsedge	P	P	E		F	F	P	P	F	G	F	F	P		P	P
plantains	G	P	G				P	P	E	E	F	F	G	G	P	P
wild garlic/onion							P	P	G	G	F	F	G	G	P	P
<b>ANNUAL GRASSES</b>																
barnyardgrass	G		P		F		G		E		G		P	P	G	
crabgrass	G		F		F		G		E		G		P	P	G	
crowfootgrass	G		P		F		G		E		G		P	P	G	
fall panicum	G		F				G		E		G		P	P	G	
goosegrass	G		F		F		G		E		G		P	P	G	
johnsongrass (seedling)	G		P				E		E		E		P	P	E	
ryegrass, annual		G	F		P		G	G	G	G	F	G	P	P	E	E
sandbur			P		P		G		E		G		P	P	G	
signalgrass, broadleaf	G		P		P		E		E		G		P	P	E	
Texas panicum	G		P		P		E		E		E		P	P	E	

<p>Key to Response Symbols:  E – Excellent  G – Good Control  F – Fair Control  P – Poor Control</p>	<p><sup>1</sup> PRE – Preemergence; PDS – Post emergence Directed Spray.  <sup>2</sup> S – Spring; F – Fall.  <sup>3</sup> Gramoxone will control only the seedling stages of Florida pusley.  * Gramoxone and Rely provide only contact control of many species.  + Fusilade and Prism are fluazifop and clethodim, respectively; and have similar activity on most weeds. Weed response also reflects Select herbicide.  If no symbol is given, weed does not occur in specific season (spring or fall) or weed response is unknown.</p>
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**WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS**

	Chateau		ZEUS		Oxyfluorfen		Fusilade Clethodim <sup>+</sup>		Glyphosate		Paraquat		2,4-Damine		Poast		Trellis	
Application Method <sup>1</sup>	PRE		PRE		PRE		PDS		PDS		PDS		PDS		PDS		PDS	
Time of Year <sup>2</sup>	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
<b>ANNUAL BROADLEAF WEEDS</b>																		
bristly starbur	G				F-G				G		F-G		G		P			
chickweed	G	G		G					G	G	F	G	F	F	P	P		
cocklebur	G		G		G				E		G		E	E	P		E	E
crotalaria					E				E		G		G		P			
croton, tropic	G		G		E				E		F-G		G		P			
evening primrose	G	G		G	F	G			P-F	F	F	F-G	F	G			G	G
Florida beggarweed					P				E		E		F				E	
Florida pusley	G				E				G		F <sup>3</sup>		F		F	F	G	G
horseweed	G	G		G	P	F			G-E	G-E	F*	F	G			P	E	E
jimson weed	G		G		G				E		G		E		P			
lambsquarters	G		E		E				G		G		E		P		E	
morningglories	G		G		F-G				G		G		G		P		E	
pigweed	E		E		E				G		G		G		P		G	
prickly lettuce				G		G			G	G	F	G	G	G	P	P		E
prickly sida (teaweed)	G		G		E				G	F	G	P	G		P		G	
purslane, common	G		G		E				E		G		E		P		G	
ragweed, common	G		G		E				G		G		E	E	P		G	
sicklepod					F				G		E		E		P			
wild radish	G	G		G	G-E	E			E	E	F	G	G	G	P	P		

<p>Key to Response Symbols:</p> <p>E – Excellent</p> <p>G – Good Control</p> <p>F – Fair Control</p> <p>P – Poor Control</p>	<p><sup>1</sup> PRE – Preemergence; PDS – Post emergence Directed Spray.</p> <p><sup>2</sup> S – Spring; F – Fall.</p> <p><sup>3</sup> Gramoxone will control only the seedling stages of Florida pusley.</p> <p>* Gramoxone and Rely provide only contact control of many species.</p> <p>+ Fusilade and Prism are fluzifop and clethodim, respectively; and have similar activity on most weeds. Weed response also reflects Select herbicide.</p> <p>If no symbol is given, weed does not occur in specific season (spring or fall) or weed response is unknown.</p>
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**WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS**

	Aim		Glufos		Rely*		Velpar		Sanda		Basagran		Stinger		Rimsulfuron		Starane	
Application Method <sup>1</sup>	PDS		PDS		PDS		PRE/PDS		PDS		PDS		PDS		PRE/PDS			
Time of Year <sup>2</sup>	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
<b>BIENNIAL AND PERENNIAL WEEDS</b>																		
asters					G	G	E	E					E	E				
bahiagrass					F	F	F								P			
bermudagrass					F	F	P	P										
briars					G	G	F	F							P		G	
camphorweed							G											
dallisgrass					F	F	F								P			
dogfennel					G	G	G				F						G	
horsenettle					F	F	F						F				G	
johnsongrass							F											
nutsedge					F	F	F		E		G				F			
plantains					G	G	G	G									G	
wild garlic/onion					G	G	G											
<b>ANNUAL GRASSES</b>																		
barnyardgrass					G	G	F											
crabgrass					G	G	G								F			
crowfootgrass					G	G	F											
fall panicum					G	G	F											
goosegrass					G	G	F											
johnsongrass (seedling)					G	G	F											
ryegrass, annual					G	E												
sandbur					G	G	F											
signalgrass, broadleaf					G	G	F											
Texas panicum					G	G	F											

<p>Key to Response Symbols:</p> <p>E – Excellent</p> <p>G – Good Control</p> <p>F – Fair Control</p> <p>P – Poor Control</p>	<p><sup>1</sup> PRE – Preemergence; PDS – Post emergence Directed Spray.</p> <p><sup>2</sup> S – Spring; F – Fall.</p> <p><sup>3</sup> Gramoxone will control only the seedling stages of Florida pusley.</p> <p>* Gramoxone and Rely provide only contact control of many species.</p> <p>+ Fusilade and Prism are fluazifop and clethodim, respectively; and have similar activity on most weeds. Weed response also reflects Select herbicide.</p> <p>If no symbol is given, weed does not occur in specific season (spring or fall) or weed response is unknown.</p>
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**WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS**

	Aim		Glufos		Rely*		Velpar		Sandeia		Basagran		Stinger		Rimsulfuron		Starane	
Application Method <sup>1</sup>	PRE		PDS		PDS		PRE/PDS		PDS		PDS		PDS		PRE/PDS			
Time of Year <sup>2</sup>	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
<b>ANNUAL BROADLEAF WEEDS</b>																		
bristly starbur			G	G	G	G	G				G							
chickweed			E	E	E	E	G	G							G		E	
cocklebur	G		G	G	G	G	G		E		E		E		F		E	
crotalaria							G				P							
croton, tropic			G	G	G	G	G				G							
evening primrose	F-P		G	G	G	G	E	E									G	G
Florida beggarweed			G	G	G	G	F						E					
Florida pusley							G											
horseweed			G	G	G	G	G	E					E		E		G	G
jimson weed	G		G	G			G				E		E					
lambquarters	E		G	G	G	G	G		F		F				F			
morningglories	G				G	G	F		F		F				F		G	
pigweed	G		G	G	G	G	G		G		P				E			
prickly lettuce	F		G	G			G	G						E			G	G
prickly sida (teaweed)			G	G	G	G	F				G							
purslane, common	G		G	G	G	G	G				G				G		G	
ragweed, common			G	G	G	G	G		E		G		E		F			
sicklepod			G	G	G	G	F						E		F		G	
wild radish	F		G	G	G	G	G	G	E	E	G	G			E			

<p>Key to Response Symbols:</p> <p>E – Excellent</p> <p>G – Good Control</p> <p>F – Fair Control</p> <p>P – Poor Control</p>	<p><sup>1</sup> PRE – Preemergence; PDS – Post emergence Directed Spray.</p> <p><sup>2</sup> S – Spring; F – Fall.</p> <p><sup>3</sup> Gramoxone will control only the seedling stages of Florida pusley.</p> <p>* Gramoxone and Rely provide only contact control of many species.</p> <p>+ Fusilade and Prism are fluazifop and clethodim, respectively; and have similar activity on most weeds. Weed response also reflects Select herbicide.</p> <p>If no symbol is given, weed does not occur in specific season (spring or fall) or weed response is unknown.</p>
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