

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 2022 Fruit IPM guides will be available online prior to the initiation of the 2022 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

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HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PRE-PLANT AND SITE PREPARATION					
<i>carfentrazone</i> Aim EC 2.0EC	14	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 tank mixed with <i>glyphosate</i> .
<i>glyphosate</i> Various trade names and formulations available	9	See label	See label		Apply to emerged weeds before transplanting. Perennial weeds may require higher rates of <i>glyphosate</i> (i.e. 4 lb ai/A). <i>glyphosate</i> is systemic and will move throughout treated plant. Good on most difficult weeds (i.e. yellow and purple nutsedge). Some formulations of <i>glyphosate</i> may require the addition of an adjuvant.
PRE-EMERGENCE ^{1,2,3}					
<i>dichlobenil</i> Casoron 4G Casoron CS	20	100 lb 1.4–2.8 gal	4 2–4		Apply in early winter to plants that have been established 1 year or more. DO NOT apply during new shoot emergence. Use no later than December to mid-March. Granular formulation should be applied in January or February. Warm temperatures increase herbicide loss due to volatilization. The liquid formulation should be used when temperatures are >70°F, as temperatures above 70°F will cause <i>dichlobenil</i> volatilization and decrease efficacy. Both the granular and liquid formulations of Casoron must be watered in with 0.5–1" irrigation event to activate. The sooner activation occurs after application the better the herbicide performance. Provides good control of non-seed bearing plants (i.e. Bracken fern (<i>Pteridium aquilinum</i>), winter annuals, and Florida betony (<i>Stachys floridana</i>).
<i>mesotrione</i> Callisto 4L Motif 4L	27	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. Allow at least 14 days between applications. If early post-emergence 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>flumioxazin</i> Chateau	14	6 oz	0.1875	PHI 7 D	Apply as a directed spray. Use ONLY a single application per year. Chateau has a 7 day PHI for caneberries. Tank mix with <i>paraquat</i> for non-selective POST weed control. DO NOT tank mix with Zeus Prime.
<i>indaziflam</i> Alion 1.67 SC	29	3.5–5 fl oz	0.045 to 0.13		Use in plantings established 1 year or longer exhibiting good growth and vigor. Apply ONLY as a dormant application between late fall and early spring prior to bud swell. Two applications may be applied so long as there are at least 90 days between applications. DO NOT use on caneberries grown in sand or soils having a gravel content more than 20%. Total use rate cannot exceed more than 7 fl oz/A in soils having < 1% OM or 10 fl oz/A in soils having >1% OM. DO NOT allow spray to contact green stems, flowers, fruit, or foliage or unacceptable injury may occur. Tank mix with <i>paraquat</i> for non-selective POST weed control.
<i>isoxaben</i> Trellis 4.16 SC Trellis 75 DF	21	16 to 31 fl oz 0.66 to 1.33 lb	0.52 to 1.0 0.5 to 1.0		Trellis should be tank mixed with <i>oryzalin</i> for PRE control of annual grass weeds. Do not apply more than twice per crop year and total use rate cannot exceed 1 lb ai/A (3.1 fl oz). For non-selective POST weed control tank mix with <i>glyphosate</i> , <i>glufosinate</i> , or <i>paraquat</i> . Excellent herbicide for new transplants.
<i>norflurazon</i> Solicam 80WDG	12	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 established 12 months prior to use . Application of Solicam may result in temporary bleaching or chlorosis of the leaves from which the plant will recover. 60 day pre-harvest interval .
<i>oryzalin</i> Surflan 4AS <i>Oryzalin</i> 4AS	3	2–6 qt	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. 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 <i>glyphosate</i> for control of emerged weeds. DO NOT apply when fruit is present.

1. All pre-emergent 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 pre-emergent herbicide application, weed control may be extremely poor.
2. Most pre-emergent herbicides will only control germinating weed seed. Generally, pre-emergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most pre-emergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).
3. 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 BLACKBERRY AND RASPBERRY WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PRE-EMERGENCE^{1,2,3} (continued)					
<i>rimsulfuron</i> Solida 25 WDG Matrix 25 WDG Grapple 25 WDG	2	4 oz	0.063	4 H/ 14 D	<i>Rimsulfuron</i> has POST and PRE activity on broadleaf and some grass weeds. For broad spectrum residual control of annual grass weeds tank mix <i>rimsulfuron</i> with <i>oryzalin</i> or Sinbar. For nonselective POST weed control, tank mix <i>rimsulfuron</i> with <i>paraquat</i> . 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. <i>Rimsulfuron</i> 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 can occur but primocanes should recover.
<i>simazine</i> Princep 4L, 90WDG Various generic formulations	5	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. DO NOT use on gravelly, sand, or loamy sand soils. DO NOT apply when fruit is present. Apply in combination with <i>oryzalin</i> or Solicam for improved annual grass control.
<i>oryzalin</i> Surflan 4AS <i>Oryzalin</i> 4AS + <i>simazine</i> Princep 4L, 90WDG		2–4 qt + 2.2 lb 2 qt	2–4 + 2	24 H	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 <i>simazine</i> . DO NOT apply when fruit is present. DO NOT use on gravelly, sand, or loamy sand soils.
<i>sulfentrazone</i> Zeus XC 4L	14	6–12 oz	0.1875–0.375	12 H/ 15 D	Apply as a directed spray to caneberries that have been established for 3 growing seasons. Sequential applications may be used so long as total use rate does not exceed 12 fl oz on a broadcast basis. Allow at least 60 days between applications. Tank mix with <i>oryzalin</i> for extended residual control of annual grass weeds. The addition of <i>paraquat</i> + non-ionic surfactant will be necessary for non-selective POST weed control.
<i>sulfentrazone</i> + <i>carfentrazone</i> Zeus Prime XC	14	7.7–15.2 fl oz	0.19 + 0.02 to 0.37 + 0.04	12 H	Apply as directed spray to caneberries that have been established 2 years or longer. Zeus Prime XC may be applied twice per year so long as the total use rate does not exceed 15 fl oz/A on a broadcast basis. Allow at least 60 days between applications. Apply in combination with <i>oryzalin</i> for extended residual control of annual grass weeds. Tank mix with <i>paraquat</i> for non-selective POST weed control.
<i>terbacil</i> Sinbar 80WDG	5	0.5–2 lb	0.4–1.6	12 H/ 90 D	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. DO NOT spray foliage. DO NOT use on sandy soils with less than 3% organic matter. See replant restrictions. <i>Terbacil</i> will provide POST control of certain broadleaf weeds, however susceptible species need to be less than 2" tall.

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2. Most pre-emergent herbicides will only control germinating weed seed. Generally, pre-emergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most pre-emergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).
3. 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).

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POST-EMERGENCE (continued)					
<i>2,4-D</i> Embark Extra 3.8L	4	2.5–5.0 pt (yearly max)	1.19–2.38	48 H/ 30 D	Excellent for controlling broadleaf weeds. <i>2,4-D</i> can cause minor damage to leaves / plants, but damage is transient with labeled rates. Do not use if <i>2,4-D</i> damage is unacceptable to your farm. If you have never used <i>2,4-D</i> before or have concerns about damage, use on small acreage before large scale applications are made so as to evaluate for acceptable damage. Best if direct applications are made and avoid spray contact on cane/leaves. If directed backpack applications are made, treatment solution should be 2 tablespoons (30 mls) <i>2,4-D</i> to 1 gallon H ₂ O, plus nonionic surfactant. This treatment solution should be applied to 1000 ft ² , spraying undesirable broadleaf plants until runoff. <i>2,4-D</i> can be tank mixed but would need to do jar test to confirm compatibility with other herbicides. Single application max is 2.5 pt/A and yearly max is 5.0 pt/A. Good for row middle broadleaf weed control.
<i>carfentrazone</i> Aim EC 2.0EC Aim EW 1.9EW	14	0.5–6.4 fl oz	0.008–0.1	12 H	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> Gramoxone 3 SL Parazone 3 SL <i>Paraquat</i> Concentrate 3 SL	22	1.7–2.5 pt	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 pre-emergence herbicides to provide post-emergence and residual weed control. Contact with new growth will cause injury.
<i>quinclorac</i> QuinStar 4L	4	8.4–16.8	0.26–0.52	12 H/ 30 D	<i>Quinclorac</i> provides postemergence control of barnyardgrass, crabgrass, hemp sesbania, morningglories, small alligatorweed, prickly lettuce, and field bindweed. Do not apply more than 12 oz/A per application. Do not make second application before 30 days. Apply with crop oil at 2 pints per acre or non-ionic surfactant at labeled rates. Do not apply 30 days before harvest.
POST-EMERGENCE GRASS CONTROL					
<i>clethodim</i> SelectMax 0.97EC Arrow 2 EC	1	12–16 fl oz 6–8 fl oz	0.094–0.121	24 H/ 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. Select Max and Arrow have a 7-day PHI for caneberry. Unless otherwise noted on the label, all other <i>clethodim</i> formulations are for non-bearing caneberry plantings.
<i>fluazifop</i> Fusilade DX 2L	1	16–24 fl oz	0.25–0.38	12 H/ 1 D	Sequential applications will be necessary for controlling perennial grass weeds. The addition of crop oil concentrate at 1% v/v (1 gal per 100 gal of spray solution) will be necessary for optimum herbicide performance. Sprayer application volume should not exceed 25 GPA. Make application to johnsongrass: 12–18" tall; bermudagrass: 3" tall or with 4–8" runners; annual grasses: 2–8" tall. Does not control nutsedge. Total use rate cannot exceed 48 fl oz/A per year. Fusilade has a 1 day PHI.
<i>sethoxydim</i> Poast 1.5EC	1	1–2.5 pt	0.18–0.47	12 H/ 45 D	Use for control of annual and perennial grasses. Sequential applications will be necessary for control of perennial grass weeds. May be used on bearing raspberries or blackberries, but not within 45 days of harvest. 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.

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2. Most pre-emergent herbicides will only control germinating weed seed. Generally, pre-emergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most pre-emergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).
3. 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).

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PRE-PLANT					
<i>glyphosate</i> Various trade names and formulations available	9	See label	See label	4–12H/ 14 D	Apply to emerged weeds before transplanting. Perennial weeds may require higher rates of <i>glyphosate</i> (i.e. 4 lb ai/A). <i>glyphosate</i> is systemic, and will move throughout treated plant. Good on most difficult weeds (i.e. yellow and purple nutsedge). Some formulations of <i>glyphosate</i> may require the addition of an adjuvant.
PRE-EMERGENCE ^{1,2,3}					
<i>dichlobenil</i> Casoron 4G	20	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-March. Warm temperatures increase herbicide loss due to volatilization. The liquid formulation should be used when temperatures are >70°F, as temperatures above 70°F will cause <i>dichlobenil</i> volatilization and decrease efficacy. Both the granular and liquid formulations of Casoron must be watered in with 0.5–1" irrigation event to activate. The sooner activation occurs after application the better the herbicide performance. Provides good control of non-seed bearing plants (i.e. Bracken fern (<i>Pteridium aquilinum</i>), winter annuals, and Florida betony (<i>Stachys floridana</i>).
<i>diuron</i> Direx 4L, Karmex 80DF, Various generic formulations	2	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	14	6–12 oz/A	0.375–0.75	12 H/ 60 D	Excellent herbicide for pre-emergence 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 post-emergent activity).
<i>hexazinone</i> Velpar 80DF	5	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>imdaziflam</i> Alion 1.67L	29	3.5–7 oz	0.045–0.097	12 H/ 14 D	Excellent pre-emergence herbicide, use at 3.5–7 oz/A if soil organic matter is ≤1% and 5–10 oz/A if soil organic matter is ≥1%. Only apply Alion to dormant plant before bud swell in the fall. Do not allow spray to contact green stems, leaves, flowers, and berries.
<i>isoxaben</i> Trellis 4.16 SC Trellis 75 DF	21	16–31 fl oz 0.66–1.33 lb	0.5 to 1.0		Trellis should be tank mixed with <i>oryzalin</i> for PRE control of annual grass weeds. Do not apply more than twice per crop year and total use rate cannot exceed 1 lb ai/A. For non-selective POST weed control tank mix with <i>glyphosate</i> , <i>glufosinate</i> or <i>paraquat</i> . Excellent herbicide for new transplants.
<i>mesotrione</i> Callisto 4L	27	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 post-emergence 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	15	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.

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2. Most pre-emergent herbicides will only control germinating weed seed. Generally, pre-emergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most pre-emergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).
3. 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).

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PRE-EMERGENCE ^{1,2,3} (continued)					
<i>norflurazon</i> Solicam 80WDG	12	2.5–5 lb	2–4	12 H/ 30 D	Provides excellent pre-emergence 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	3	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 <i>glyphosate</i> for control of emerged weeds. Benefits highly from a tank mix partner like Simazine or Trellis. Do not apply when fruit is present.
<i>oryzalin</i> Surflan 4AS Oryzalin 4AS + <i>simazine</i> Princep 4L, 90WDG	3 + 5	2–4 qt + 2.2 lb 2 qt	2–4 + 2	24 H/ —	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 <i>simazine</i> . 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	3 + 21	2–4 qt + 0.66–1.33 lb	2–4 + 2	24 H/ 60 D	Provides excellent pre-emergent weed control of many small seeded broadleaf weeds. Especially useful on plantings less than 6 months old, and if worried about damage to young blueberries by <i>simazine</i> .
<i>pronamide</i> Kerb 50W	3	2–4 lb	1–2	24 H/ 2 D	Apply as a single directed spray in established blueberries only for early post-emergence control of susceptible winter annual weeds, perennial grasses, and chickweed and for pre-emergence 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> Matrix 75SG	2	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 4 oz 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	5	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. <i>norflurazon</i> , <i>oryzalin</i>). 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 XC 4L	14	6–12 oz	0.1875–0.375	12 H/ 15 D	Excellent pre-emergence weed control (8–12 weeks) that rivals Chateau (<i>flumioxazin</i>), but with the ability to control yellow nutsedge (<i>Cyperus esculentus</i>) without the damage of Sedgehammer (<i>halosulfuron</i>). Sequential applications (6 oz/A—twice) are the most effective on yellow nutsedge. See label for details.

1. All pre-emergent 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 pre-emergent herbicide application, weed control may be extremely poor.
2. Most pre-emergent herbicides will only control germinating weed seed. Generally, pre-emergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most pre-emergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).
3. 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

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PRE-EMERGENCE ^{1,2,3} (continued)					
<i>sulfentrazone</i> + <i>carfentrazone</i> Zeus Prime XC	14	7.7–15.2 fl oz	0.19 + 0.02 0.37 + 0.04	12 H	Zeus Prime XC may be applied twice per year so long as the total use rate does not exceed 15 fl oz/A on a broadcast basis. Allow at least 60 days between applications. Tank mix with <i>paraquat</i> 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 <i>oryzalin</i> .
<i>terbacil</i> Sinbar 80WDG	5	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.
PRE-EMERGENCE HERBICIDES FOR CONTAINER PRODUCTION (BLUEBERRIES GROWN FOR PLANTS ^{1,2,3})					
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>benefin/oryzalin</i> XL 2G	15, 3	150 lb	3	24 H/ 1 Year	USE ON NON-BEARING PLANTS ONLY. No post-emergent 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	3	2 qt 20 oz	0.5 0.5	12 H/ 1 Year	USE ON NON-BEARING PLANTS ONLY. Provides pre-emergent control of most annual grasses and small seed broadleaf weeds. Also provides early post-emergent control of some annual grasses up to 3 tillers. Use on 1-year old plants.
<i>isoxaben</i> <i>dithiopyr</i> Crew 0.75G	21, 3	100–200 lb	0.5 to 1.0 0.25 to 0.5	12 H / 1 Year	USE ON NON-BEARING PLANTS ONLY. Provides good pre-emergent control of most annual grasses and small seed broadleaf weeds. Also provides early post-emergent control of some annual grasses up to 3 tillers. Use on transplant after soil in containers is settled.
<i>flumioxazin</i> Broadstar 0.25GR Chateau 51WDG	14	150 lb 6–12 oz	0.375 0.375–0.75	12 H/ 1 Year	Excellent pre-emergence 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 post-emergent activity).
<i>indaziflam</i> Marengo 0.622 lbs/gal 0.224 GR	29	7.5–15 oz 100–200 lb	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 one of the longest pre-emergence weed control windows of any pre-emergence herbicide. DO NOT apply more than 200 lb/A (granular) or 15 oz/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 Trellis SC	21	0.66–1.33 lb 23–31 oz	0.5–1	12 H/ 1 Year	Provides excellent pre-emergent weed control of many small seeded broadleaf weeds. Maximum of 1 lb ai/year. Needs a tank mix partner for annual grass control (i.e., <i>oryzalin</i>)
<i>oxadiazon</i> Regalstar 2G	14	100–200 lb	2–4	12 H/ 1 Year	USE ON NON-BEARING PLANTS ONLY. Provides good pre-emergent 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	3, 21	150–200 lb	3.75–5	12 H/ 1 Year	USE ON NON-BEARING PLANTS ONLY. No post-emergent 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	14 + 3	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.

1. All pre-emergent 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 pre-emergent herbicide application, weed control may be extremely poor.
2. Most pre-emergent herbicides will only control germinating weed seed. Generally, pre-emergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most pre-emergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).
3. 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).

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POST-EMERGENCE HERBICIDES²					
<i>2,4-D</i> Embark Extra 3.8L	4	3.0–6.0 pt (yearly max)	1.19–2.38	48 H/ 30 D	Excellent for controlling broadleaf weeds. <i>2,4-D</i> can cause minor damage to leaves/plants, but damage is transient with labeled rates. Do not use if <i>2,4-D</i> damage is unacceptable to your farm. If you have never used <i>2,4-D</i> before or have concerns about damage, use on small acreage before large scale applications are made so as to evaluate for acceptable damage. Best if direct applications are made and avoid spray contact on stem/leaves. If directed backpack applications are made, treatment solution should be 2 tablespoons (30 mls) <i>2,4-D</i> to 1 gallon H ₂ O, plus nonionic surfactant. This treatment solution should be applied to 1000 ft ² , spraying undesirable broadleaf plants until runoff. <i>2,4-D</i> can be tank mixed but would need to do jar test to confirm compatibility with other herbicides. Single application max is 3.0 pt/A and yearly max is 6.0 pt/A. Good for row middle broadleaf weed control.
<i>glufosinate</i> Rely 280 2.34L Cheetah 2.34L Reckon 280 2.34L	10	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. DO NOT allow spray drift to contact desirable foliage or uncalled bark of young branches as damage will occur. DO NOT apply more than 12 qts/A/year of Rely. DO NOT apply within 14 days of harvest or through any type of irrigation system.
<i>glyphosate</i> Various trade names and formulations	9	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. DO NOT allow spray to contact foliage or green bark. Refer to product label for rates to control specific weeds and post-harvest restrictions. May be tank mixed with certain pre-emergence herbicides to provide post-emergence and residual weed control. Blueberry growing in bark beds or other soil-less media are susceptible to <i>glyphosate</i> injury.
<i>quinclorac</i> QuinStar 4L	4	12 oz	0.375	12 H/ 30 D	Quinclorac provides postemergence control of barnyardgrass, crabgrass, hemp sesbania, morningglories, small alligatorweed, yellow nutsedge, and other difficult weeds. Do not apply more than 12 oz/A per application. DO NOT make second application before 30 days. Apply with crop oil at 2 pints per acre or non-ionic surfactant at labeled rates. Make directed applications to established blueberries greater than 18–24 inches. DO NOT apply 30 days before harvest.
POST-EMERGENCE (GRASS HERBICIDES)²					
<i>clethodim</i> SelectMax 0.97EC	1	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	1	24 oz	0.375	12 H/ 14 D	Controls annual and perennial grasses after they have emerged. Sequential applications will be necessary for perennial grass control. Crop oil concentrate (1 qt/A) will enhance weed control as compared to non-ionic surfactants, but non-ionic surfactants provided more safety to young plants. 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>halosulfuron</i> Sanda 75DF Other formulations	2	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 pre-emergence 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. DO NOT apply more than 2 oz in a 12-month period. Post-harvest interval is 14 days.
<i>sethoxydim</i> Poast 1.5EC	1	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.

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

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		
PRE-EMERGENCE					
<i>isoxaben</i> Trellis SC	21	16–31 fl oz	0.5–1		Apply as a directed spray in newly planted vineyards once soil has settled after transplanting or in bearing vineyards. Total use rate per year (from harvest to harvest) cannot exceed 31 fl oz/A. Trellis SC has a 60 day PHI. Tank mix with <i>oryzalin</i> or <i>pendimethalin</i> for preemergence control of annual grasses.
<i>oryzalin</i> Surflan 4AS 4 lb/gal <i>oryzalin</i> 4 lb/gal	3	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). DO NOT apply to newly established vines until soil has settled and no cracks are present. Apply before annual weeds emerge or add <i>paraquat</i> , Rely or <i>glyphosate</i> 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 51SW Tuscany 51 WDG Flumi 51 WDG	14	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. DO NOT 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 <i>glyphosate</i> . Apply with either glufosinate or <i>paraquat</i> for non-selective POST weed control after bud break. DO NOT apply within 60 days of harvest. 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. DO NOT 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	5	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. DO NOT use on sand, loamy sand, or gravelly soils. May be tank mixed with Surflan for broad spectrum annual grass and broadleaf weed control. Add <i>paraquat</i> , glufosinate or <i>glyphosate</i> for control of emerged weeds. Tank mixing with <i>oryzalin</i> or Prowl H ₂ O will improve PRE control of annual grass weeds.
<i>diuron</i> Karmex XP, Diuron 80DF	7	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. DO NOT use on sand, loamy sand, gravelly soils, or on exposed subsoils. DO NOT 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 <i>oryzalin</i> or Solicam for broad spectrum annual grass and broadleaf weed control.
<i>indaziflam</i> Alion 1.67 SC	29	3.5–5 fl oz	0.045–0.065		Use in vineyards established 3 years or longer and on vines having good growth and vigor. Grapes must have a 6" barrier between the soil surface and a major portion of the vines' root system. DO NOT use on grapes planted in sandy soils. Rate is soil texture dependent. See label for details. Total use rate cannot exceed 5 fl oz in a 12 month period. When making more than 1 application per year allow at least 90 days between applications. Tank mix with <i>paraquat</i> , <i>glyphosate</i> , or <i>glufosinate</i> for non-selective POST weed control.
<i>oxyfluorfen</i> Goal 2XL	14				Apply ONLY 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. DO NOT apply during the growing season or bud swell stage of growth. May be used as a pre-emergence or post-emergence treatment. Use the higher rates for pre-emergence applications. May be tank mixed with <i>simazine</i> , Devrinol, <i>oryzalin</i> , <i>paraquat</i> , or <i>glyphosate</i> . Refer to Goal label for information on rates for post-emergence treatments and tank mixes.
Galigan 2E		2–8 qt	0.5–2		
Oxiflo 2EC 2 lb/gal					
Goal Tender 3EC 4 lb/gal		1–4 pt			

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PRE-EMERGENCE (continued)					
<i>sulfentrazone</i> + <i>carfentrazone</i> Zeus Prime XC	14	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. Applications made after bud break must be made with hooded application equipment. Zeus provides control of yellow nutsedge (see label) as well as broadleaf and grass weeds. For optimum PRE control of annual grasses tank mix Zeus with <i>oryzalin</i> . If applying in a band and 50% or less of the vineyard is treated Zeus may be applied twice within a 12-month period so long as total use rate does not exceed 15 fluid ounces on a broadcast basis. Allow 60 days or more between applications. Zeus has a 3 day PHI. Tank mix with <i>paraquat</i> , <i>glyphosate</i> , or glufosinate for non-selective POST weed control.
<i>pendimethalin</i> Prowl H ₂ O 4 lb/gal	3	2–6 qt	2–6		Use for control of annual grasses and small seeded broadleaf weeds. In newly planted vineyards allow soil to settle after transplanting before applying Prowl. Applications in newly planted and 1 year old vineyards must be prior to bud swell while vines are dormant. In vineyards established 2 years or more apply any time after harvest, during winter dormancy, in the spring, and in season before harvest. Prowl H₂O has a 21 day PHI. Tank mix with <i>simazine</i> , <i>rimsulfuron</i> , or Zeus Prime for expanded control of broadleaf weeds. Rainfall or irrigation (at least 0.5") within 7 days of application is necessary for effective weed control.
<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 pre-emergence weed control in vineyards where plants have been established for 3 years. DO NOT use on sandy, loamy sand, or gravelly soils. Tank mix with <i>paraquat</i> , <i>glufosinate</i> , or <i>glyphosate</i> for control of emerged weeds.
<i>rimsulfuron</i> Matrix 25WG Pruvin 25WG Solida 25WG Grapple 25 WG	2	4 oz	063		<i>Rimsulfuron</i> has PRE and POST activity on broadleaf and some grass weeds. For broad spectrum residual control Matrix should be tank mixed with <i>oryzalin</i> or <i>diuron</i> . It should be tank mixed with <i>glyphosate</i> , <i>paraquat</i> , or <i>glufosinate</i> for non-selective POST weed control. DO NOT treat vineyards established < 1 year. Rainfall is necessary for activation. DO NOT apply within 14 days of harvest. <i>Rimsulfuron</i> 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.
POST-EMERGENCE					
<i>paraquat</i> Firestorm Gramoxone SL 3 Paraquat Concentrate Parazone 3 lb/gal	22	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. DO NOT allow spray drift to contact foliage or green cane tissue, since 90 day damage may occur. May be tank mixed with certain pre-emergence herbicides for post-emergence and residual weed control.

COMMERCIAL GRAPE WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POST-EMERGENCE (continued)					
<i>glufosinate</i> Cheetah Reckon Rely Lifeline Surmise and various other brands 2.34 lb/gal	10	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. DO NOT allow spray drift to contact foliage or green cane tissue, since severe damage may occur. May be tank mixed with certain pre-emergence herbicides for post-emergence and residual weed control. Does not have soil residual activity. DO NOT make more than 3 applications/year. The addition of a spray grade <i>ammonium sulfate</i> fertilizer enhances herbicide activity. The use of additional surfactants or crop oil is not needed and may increase the potential for bark damage.
<i>glyphosate</i> Various brands and formulations	9	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. DO NOT 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. Allow a minimum of 14 days between last application and harvest. Some difficult to control perennial weeds may require higher rates. Refer to label for rate and application timing for certain perennial weeds. Applying <i>glyphosate</i> in spray volumes of 25 gal/A or less is recommended for optimum results. Generic <i>glyphosate</i> formulations may require surfactant. Tank mix with residual herbicides for post-emergence and pre-emergence 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	1	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.
Select Max 1 lb/gal					
Intensity One 1 lb/gal					
<i>fluzifop</i> Fusilade DX 2 lb/gal	1	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. DO NOT apply within 50 days of harvest.
<i>sethoxydim</i> Poast 1.5 lb/gal	1	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). DO NOT use more than 5 pt/A/season and the last application must be made at least 50 days prior to harvest. 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	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. DO NOT apply within 3 days of harvest. 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. DO NOT use on newly transplanted vines. See label for details regarding its use for sucker management.

COMMERCIAL PECAN INSECT CONTROL (BEARING TREES)

Angel Acebes, Research Entomologist
Will Hudson, Extension Entomologist
Andrew Sawyer, Area Pecan Agent

ORCHARD SURVEY PROCEDURES

Insect and mite infestation levels should be estimated at least weekly based on thorough orchard sampling. Sample trees in all segments of each orchard. A good method is to sample every fourth tree in every fourth tree row (about 10% of the trees). Sample each major cultivar represented in the orchard. Sample a minimum of 10 terminals per tree. Check all compound leaves and the nut clusters

on each terminal. Check as high in the tree as possible. Foliar pest counts should be made on compound leaves surrounding the nut clusters. Nut clusters should be inspected carefully for the presence of pests or damage. Hickory shuckworm damage should be monitored mid-season by examining fallen nuts for a whitish spot on the side. Pecan weevil populations should be monitored by survey traps.

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS	
Phylloxera	<i>thiamethoxam</i> Centric 40WG	4A	2–2.5 oz	12 H/ 14 D	Treat trees with a recent history of heavy infestation and surrounding trees. Apply at budbreak with the first pre-pollination spray.	
	<i>imidacloprid</i> Several formulations	4A	See label	12 H/ 7 D	Note: Other <i>imidacloprid</i> formulations are available. Read labels carefully to find the proper rate and maximum allowable limits.	
Spittlebugs	<i>imidacloprid</i> Several formulations	4A	See label	12 H/ 7 D	Spittlebug infestations are easily recognized by the white, frothy masses on terminals or nut clusters. Definite thresholds have not been established and treatment is seldom needed.	
Pecan Nut Casebearer	<i>spinosad</i> Spintor 2SC	5	4–10 oz	4 H/ 1 D	Light infestations causing occasional damage do not require control in most crop years. The most serious damage usually occurs in mid-May. Adult emergence should be monitored with pheromone traps. Place traps in orchards by mid-April. Begin sampling for nut casebearer in the first week of May. Pay particular attention to orchards not under a spray program the preceding year and orchards with a recent history of nut casebearer problems. Try to time sprays to stop injury before more than one nut per cluster is infested. It is recommended that broad-spectrum contact insecticides, such as the pyrethroids, not be used in early- or mid-season to conserve beneficial insect populations. (See Special Considerations section.)	
	<i>diflubenzuron</i> Dimilin 2L	15	8–16 oz	12 H/ 28 D		
	<i>clothianadin</i> Belay	4A	3–6 oz	12 H/ 21 D		
	<i>methoxyfenozide</i> Intrepid 2F	18	4–8 oz	4 H/ 7 D		
	<i>methoxyfenozide</i> + <i>spinetoram</i> Intrepid Edge	5 + 18	4–6.4 oz	4 H/ 7 D		
	<i>tolfenpyrad</i> Apta	21	17–27 oz	12 H/ 14 D		DO NOT apply more than 1 application. No more than 27 oz/A/season.
	<i>cyantraniliprole</i> + <i>abamectin</i> Minecto Pro	6 + 28	8–12 oz	12 H/ 21 D		No more than 2 consecutive applications, no more than 24 oz/A/season.
Mites	<i>abamectin</i> Agri-Mek SC, Abba, and others	6	See label for product-specific rates	12 H/ 21 D	A non-ionic surfactant or horticultural oil MUST be added to the tank.	
	<i>bifenazate</i> Acramite 4SC	Unclassified	12–24 oz	12 H/ 14 D	See Timing and Remarks top of next page.	

COMMERCIAL PECAN INSECT CONTROL

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS
Mites (continued)	<i>spirodiclofen</i> Envidor 2SC	23	14–18 oz	12 H/ 7 D	Mites, especially the pecan leaf scorch mite, are normally late season pests. Mite damage appears as bronzed, scorched areas on the undersides of leaflets. Scorched areas begin at the leaflet midribs then spread out toward leaflet margins. Mites often build up on low limbs in the shaded, interior portions of trees then spread rapidly up and out. For heavy infestations, repeat the application in 5–7 days. Savey is an ovicide and should be tank-mixed with an adulticide. Zeal is primarily an ovicide/larvicide. Magister SC requires no more than one application per year.
	<i>fenpyroximate</i> Portal	21A	2 pt	12 H/ 14 D	
	<i>pyridaben</i> Nexter SC	21	5.2–10.67 oz	24 H/ 7 D	
	<i>hexythiazox</i> Savey 50DF	10A	3–6 oz	12 H/ 28 D	
	<i>etoxazole</i> Zeal SC	10B	2–3 oz	12 H/ 28 D	
	<i>fenazaquin</i> Magister SC	21	24–36 oz	12 H/ 7 D	
Yellow Aphids	FOLIAR APPLICATIONS				Yellow aphids may be present in orchards throughout the growing season. Populations are usually highest in April–May and again in August–September. In early season, DO NOT treat yellow aphids if they are the only insect problem. Rely on beneficial insects to suppress early season populations. In prolonged dry periods, lower, chronic aphid populations may require treatment to prevent the build-up of unacceptable levels of honeydew and sooty mold. WEEKLY SCOUTING IS VERY IMPORTANT IN TIMING APHID SPRAYS, ESPECIALLY IN LATE SEASON. Rotate among classes (MOA) of insecticides between treatments to avoid resistance development. Many generic formulations of <i>imidacloprid</i> are available. Read label carefully for recommended rate. <i>Imidacloprid</i> alone may not control yellow and black-margined aphids. It is suggested that pyrethroid materials (<i>cypermethrin</i> , <i>bifenthrin</i> , etc.) not be used, alone or in combination, in early- or mid-season applications. For PQZ, spray no more than 2 applications or 4.8 fl oz per acre per year. DO NOT apply more than 1 application of Apta, no more than 27 oz/A/season. Use the 14 oz rate for black pecan aphid control.
	<i>acetamiprid</i> Assail 30SG	4A	2.5–9.6 oz	12 H/ 14 D	
	<i>afidopyropen</i> Sefina	9D	3.0–6.0 oz	12 H/ 7 D	
	<i>clothianidin</i> Belay	4A	3–6 fl oz	12 H/ 21 D	
	<i>flonicamid</i> Beleaf, Carbine	9C	2–2.8 oz	12 H/ 40 D	
	<i>flupyradifurone</i> Sivanto 200 SL	4D	7.0–10.5 oz	4 H/ 7 D	
	<i>imidacloprid</i> Several formulations	4A	See label	12 H/ 7 D	
	<i>pymetrozine</i> Fulfill 50WG	9B	4 oz	12 H/ 14 D	
	<i>pyridaben</i> Nexter	21	5.2–10.67 oz	24 H/ 7 D	
	<i>pyrifluquinazon</i> PQZ	9B	2.4–3.2 oz	12 H/ 7 D	
	<i>sulfoxaflor</i> Closer SC Transform WG	4C	1.5–2.75 oz 0.75–1.5 oz	12 H/ 7 D	
	<i>thiamethoxam</i> Centric 40 WG	4A	2–2.5 oz	12 H/ 14 D	
	<i>tolfenpyrad</i> Apta	21A	17–27 oz	12 H/ 14 D	
	SYSTEMIC APPLICATIONS				
<i>imidacloprid</i> Admire Pro	4A	7–14 fl oz	12 H/ 7 D		

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS
Black Pecan Aphid	SAME INSECTICIDES AS FOR YELLOW APHIDS	See list for yellow aphids	See list for yellow aphids. Please note that some products have different rates for black pecan aphids.	See list for yellow aphids	Black pecan aphids may cause damage as early as May but are usually a serious problem only in late season. Damage appears as yellow spots on leaflets. Damaged spots later turn brown and 2–4 damaged spots per leaflet can cause leaflet drop. Carefully check all compound leaves on 10 terminals per tree, on at least 10 trees per orchard for the presence of black pecan aphids. Prior to July 1, treat if 25% of terminals have 2 or more black aphids. After July 1, treat if 15% of terminals have more than one black aphid and nymph clusters are found. Concentrate checks on susceptible cultivars such as Schley, Sumner, and Gloria Grande. Be sure to check all compound leaves on each terminal examined.
	<i>gibberellic acid</i> ProGibb 4% ProGibb LV Plus	N/A	10 oz 5 fl oz	N/A	<i>Gibberellic acid</i> is a plant growth regulator that prevents damage from black pecan aphid feeding and inhibits establishment in the orchard. It does not affect aphids directly and will not control any other pest, including yellow aphids. Three applications should be made at 2-week intervals, beginning in mid-July, applying 10 oz (or 5 oz of ProGibb LV Plus) each time.
Hickory Shuckworm	<i>clothianadin</i> Belay	4A	3–6 oz	12 H/ 21 D	Shuckworms are active throughout the season, but do not cause significant damage until June or later. Prior to shell hardening, larval feeding causes nuts to drop. After shells harden, feeding causes shucks to stick to the shells, reducing quality. If orchards have a history of shuckworm infestation, a spray should be applied in early June. In early August, 2–3 additional sprays should be applied. Initiate August sprays at half-shell hardening and repeat at 2-week intervals until shuck split if shuckworm activity continues. Pyrethroids (Asana, Ambush, Mustang, etc.) applied for other pests will also control shuckworm. It is not necessary to spray in August if pecan weevil controls are applied. Please note the Special Considerations section regarding the use of pyrethroid materials.
	<i>diflubenzuron</i> Dimilin 2L	15	8–16 oz	12 H/ 28 D	
	<i>methoxyfenozide</i> Intrepid 2F, Turnstyle	18	4–8 oz	4 H/ 7 H	
	<i>methoxyfenozide</i> + <i>spinetoram</i> Intrepid Edge	5 + 18	4–6.4 oz	4 H/ 7 D	
	<i>tolfenpyrad</i> Apta	21A	17–27 oz	12 H/ 14 D	DO NOT apply more than 1 application, no more than 27 oz/A/season.
	<i>abamectin</i> + <i>cyantraniliprole</i> Minecto Pro	6 + 28	8–12 oz	24 H/ 21 D	No more than 2 consecutive applications, no more than 24 oz/A/season.
	<i>chlorantraniliprole</i> + <i>lambda-cyhalothrin</i> Besiege	3 + 28	6–12.5 oz	24 H/ 14 D	Besiege contains a pyrethroid, and may flare aphids and mites if used in early or mid-season. The best fit is for late season shuckworm.

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS
Pecan Weevil	<i>carbaryl</i> Carbaryl 80S Sevin 4F Sevin XLR	1A	3 lb 2–5 qt	24 H/ 14 D	Pecan weevil emergence may extend from July into October. Peak emergence is normally between August 10 and September 20. Emergence should be monitored in each infested grove with traps, knockdown sprays or a combination of these methods. Trees known to have a recent history of weevil problems should be selected for monitoring. If excessive nut drop results from pecan weevil feeding punctures before pecan shells begin to harden, spray at once. After pecan shells harden and nuts reach the "dough" or "gel" stage, treat when weevils emerge (especially following rains) and continue at 7–10 day intervals until emergence stops. APHID OR MITE POPULATIONS MAY BUILD UP WHERE CARBARYL IS USED. If these pests become a problem, apply aphicides or miticides as previously directed. Grandevo has provided levels of control comparable with chemical insecticides. Grandevo can also contribute to aphid control (and thus will not flare aphid populations). Harm to beneficial insects (lady beetles and lacewings) has not been detected. Grandevo can be used in organic pecan production; it is OMRI listed and NOP compliant. The use of an adjuvant is recommended, avoid acidifying agents. NOTE: Several pyrethroids as well as Imidan are labeled for pecan weevil control. If these materials are used for weevils, they can be expected to be most effective where weevil populations are low. They may be adequate to prevent feeding injury from weevils emerging prior to shell hardening but their use could be risky under heavy weevil pressure after nuts reach the gel stage and are subject to weevil oviposition. (See Special Considerations section). Several products are available that combine a pyrethroid insecticide with an aphicide. These products may help suppress aphids while providing weevil control. Brand names include Endigo, Leverage, and others.
	<i>Chromobacterium subsugae</i> Grandevo WDG	UNK—Dead bacterial composition	2–3 lbs	4 H/ 0 D	
	Various pyrethroids Asana XL, Ammo, Baythroid, Brigade, Mustang Max	3	See label for product-specific rates	24 H/ 21 D	
Ants, including fire ants, Argentine ants, acrobat ants, and others	Baits Extinguish, Reemit 0.5 G, Altrevin, and others	Various	1.0–1.5 lb/A	Various	The best approach is to apply a bait twice per season, generally in late April–early May and again in September.

KERNAL FEEDING HEMIPTERANS (Stink bugs and Plant bugs)

A complex of true bugs (stink bugs and plant bugs) attack pecan. They may be present in orchards all year but normally cause their most serious injury from late August through September. Prior to shell hardening, feeding injury causes nut drop. After shell hardening, their feeding causes black, bitter spots on kernels, reducing quality. They can continue to feed, through the hardened shells, until nuts are harvested. The presence and numbers of stink bugs and plant bugs should be noted in surveys throughout the season. Special attention should be paid to the true bugs in late-season orchard surveys. Treat when 1 stink bug is found per 40 terminals OR when 5 or more are found per knockdown spray on a sheet covering 20% of the area under a tree. Sprays for these insects are difficult to time properly because the bugs move in and out of orchards. Close checking

is required to detect damaging populations. No materials have consistently given excellent stink bug control, possibly due to the difficulty in timing sprays. The pyrethroids are labeled for stink bug control. Please note the pre-harvest use restrictions of the products.

FIRE ANTS

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

BORERS: AMBROSIA BEETLES AND FLATHEADED APPLE TREE BORER

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

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

SCALE INSECTS

Scale populations build slowly, but can reach damaging levels before becoming obvious. Examine fallen limbs carefully during the season for scale presence. Preferred treatment is 1–2% horticultural oil spray, applied in November–December and again in February. For severe problems, an application of Esteem in June may be necessary.

OTHER INSECT PESTS

Pests such as pecan leaf casebearer, leaf miners, walnut caterpillar, fall webworm, pecan budmoth, nut curculio, shoot curculio, Prionus root borers, and others may occasionally cause economic injury to pecan. Growers should be able to identify these pests and their damage. Color photographs of all pecan pests and their injury can be found in the *Southern Pecan Growers Handbook* and online from the UGA Extension pecan team (Google search "ugapecans"). The publication is available at \$30 per copy. For ordering information, visit: extension.uga.edu/publications/for-sale.html

Specific controls for occasional pests not covered in this spray guide can be obtained from your local county Extension agent.

SPECIAL CONSIDERATIONS

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

Pest Resistance and Chemical Use—The aphids and mites which attack pecan have demonstrated the ability to become resistant to insecticides applied for their control. The rate at which this resistance develops depends on the chemical used, the frequency of use, the duration of use, and the rates used. Aphid and mite exposure to effective materials should be minimized to prolong the effective life of the chemicals. It is suggested that no insecticide be applied until it is absolutely necessary (this can be determined by thorough sampling) and that chemicals be alternated as much as possible. Resistance to *neonicotinyl* insecticides has developed in some areas for both yellow- and black-margined pecan aphids. This class of insecticides includes *imidacloprid*, *thiamethoxam*, *acetamiprid*, and *clothianidin*. These materials no longer provide adequate control of resistant populations. Aphid and mite populations may flare following application of Sevin or pyrethroids. Growers should be alert for this response, and limit applications of these materials to the minimum necessary for weevil or stink bug control.

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

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

Will Hudson, Angel Acebes, and Andrew Sawyer, Extension Entomology
Jason Brock and Tim Brenneman, Plant Pathology

TIME OF APPLICATION	PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	INSTRUCTIONS AND REMARKS
FOLIAR SPRAYS						
Bud Break When first buds open.	Foliar disease	Fungicide				Spray sufficient volume for thorough coverage. For fungicide options, refer to the pre-pollination section for Pecan Disease Control.
	Pecan bud moth	<i>methoxyfenozide</i> Intrepid 2F	18	3–4 oz	4 H/ —	The phosphorous acid fungicides are particularly useful with their excellent activity on foliar diseases, highly systemic nature, and low risk of fungicide resistance. Scout for pecan bud moth injury at bud break and time sprays before larvae bore into the shoots.
		<i>methoxyfenozide</i> + <i>spinetoram</i> Intrepid Edge	5 + 18	4–6.4 oz	4 H/ —	
		<i>abamectin</i> + <i>cyantraniliprole</i> Minecto Pro	6 + 28	8–12 oz	12 H/ —	No more than 24 oz/A/season.
Hickory shoot curculio	Various pyrethroids			24 H/ —	Apply sprays for shoot curculio at bud-break on the earliest cultivars and repeat at 10–14 day intervals.	
Cover Sprays Three weeks after bud-break spray and every 4–6 weeks as needed.	Foliar disease	Fungicide				Spray sufficient volume for thorough coverage. Continue scouting for pecan bud moth injury and time sprays before larvae bore into the shoots.
	Pecan bud moth	<i>diflubenzuron</i> Dimilin 2L	15	8–16 oz	24 H/ —	The phosphorous acid fungicides are particularly useful with their excellent activity on foliar diseases, highly systemic nature, and low risk of fungicide resistance.
		Imidan 70WSP		1.5 lb		
		<i>methoxyfenozide</i> Intrepid 2F	18	4–8 oz	4 H/ —	
		<i>abamectin</i> + <i>cyantraniliprole</i> Minecto Pro	6 + 28	8–12 oz	12 H/ —	

PECAN DISEASE CONTROL

Jason Brock and Tim Brenneman, Department of Plant Pathology

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

■ PECAN DISEASE CONTROL

FRUIT AND NUTS

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

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
PRE-POLLINATION APPLICATIONS: EVERY 10–14 DAYS FROM BUD BREAK THROUGH NUT SET (continued)					
Scab; Downy Spot (continued)	<i>triphenyltin hydroxide</i> (TPTH) + FRAC Group 3 fungicide	30 + 3	half rate + full rate	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.				
POST-POLLINATION APPLICATIONS: EVERY 10-21 DAYS FROM NUT SET TO SHELL HARDENING					
Scab	<i>difenoconazole</i> + <i>pydiflumetofen</i> Miravis Top	3 + 11	13.6 fl oz	12 H/ 45 D	
	<i>dodine</i> Elast 400F	U12	48 fl oz	48 H/ Do not apply after shuck split	
	<i>dodine</i> Elast 400F + Group 3 OR Group 11 fungicide	U12 + 3	25–48 fl oz + full rate	48 H/ Do not apply after shuck split	
	<i>dodine</i> Elast 400F + TPTH	U12 + 30	25–48 fl oz + 6–12 fl oz (liquid) or 3.75–7.5 oz (wetable)	48 H/ Do not apply after shuck split	
	<i>phosphorous acid</i> Kphite 7LP Phostrol ProPhyt Reliant Phiticide	33	highest label rate	4 H/ —	
	<i>propiconazole</i> + <i>azoxystrobin</i> Quilt Quilt Xcel	3 + 11	20–28 fl oz 20–21 fl oz	12 H/ Do not apply after shuck split or within 45 D of harvest	
	<i>tebuconazole</i> + <i>azoxystrobin</i> Custodia Helmstar Plus	3 + 11	8.6–17.2 7.2–14.4	12 H/ 45 D	
	<i>flutriafol</i> + <i>azoxystrobin</i> Topguard EQ	3 + 11	5.0–8.0 fl oz	12 H/ 45 D	

PECAN DISEASE CONTROL

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
POST-POLLINATION APPLICATIONS: EVERY 10-21 DAYS FROM NUT SET TO SHELL HARDENING (continued)					
Scab (continued)	<i>tebuconazole</i> ⁴ + <i>trifloxystrobin</i> Absolute	3 + 11	5–7.67 fl oz	12 H/ Do not apply after shuck split or within 30 D of harvest	MOA Group 1: Risk for resistance is high. Use should be limited. When conditions are very favorable for scab, use in combination with either a full rate of TPTH or Elast. Limit the use to 1 or 2 applications per season. Available as Topsin M 70WDG, Topsin M 70 WP, and Topsin M WSB, and Topsin M 4.5 FL. Topsin XTR is a premix of <i>thiophanate methyl</i> and <i>tebuconazole</i> .
	<i>difenoconazole</i> + <i>azoxystrobin</i> Amistar Top	3 + 11	8–14 fl oz	12 H/ Do not apply after shuck split or within 30 D of harvest	MOA Group 3: Resistance risk is moderate. For best results, tank mix <i>tebuconazole</i> with a surfactant. Do not add a surfactant if mixing with other fungicides. Increasing the rate of a Group 3 fungicide will be important if reduced sensitivity is known or suspected. Stand-alone use is not recommended where reduced sensitivity is known or suspected.
	<i>tetraconazole</i> + <i>azoxystrobin</i> Brixen	3 + 11	13–20 fl oz	12 H/ 45 D	MOA Group 11: Resistance risk is moderate. Do not make more than 2 sequential applications. If only using solo products, Group 11 fungicides should not be used in more than ½ of the total number of fungicide applications. If using Group 3 tank-mixed with other modes of action, they should not be used in more than ½ of the total number of fungicide applications. Stand-alone use is not recommended where reduced sensitivity is known or suspected.
	<i>tetraconazole</i> + <i>triphenyltin hydroxide</i> Minerva Duo	3 + 30	16 oz	48 H/ 30 D	MOA Group 30: Resistance risk is low. MOA Group 33: Resistance risk is low. For best control apply in 100 GPA by ground. Three to five applications are generally recommended. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season. Do not use when there is a phosphate deficiency. Do not use these as stand-alone sprays for nut scab on very susceptible cultivars or high disease pressure.
	<i>thiophanate methyl</i> + TPTH or Elast	1 + 30 or U12	1 lb + half rate or 25 fl oz	3 D/ Do not apply after shuck split	MOA Group U12: Resistance risk is low. Do not use on Moore, Van Deman, Barton, or Shawnee. Do not use a surfactant. Do not use with foliar zinc treatments.
	TPTH + Group 3 or Group 11 fungicide	30 + 3	6–12 fl oz (liquid) or 3.75–7.5 oz (wetttable) + full rate	48 H/ 30 D	For any tank mix combination of Elast, TPTH, Group 3, or Group 11 fungicides, the rates provided are the lowest recommended and will provide excellent control of scab under most conditions. When disease pressure is elevated, the rate of either mixing partner can be increased.
	<i>triphenyltin hydroxide</i> (TPTH) Agri Tin Agri Tin Flowable Super Tin 80WP Super Tin 4L	30	7.5 oz 12 fl oz 7.5 oz 12 fl oz	48 H/ 30 D	
	<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.

POWDERY MILDEW: For powdery mildew, the scab fungicide program can be adjusted if needed. The FRAC Group 3 fungicides or mixes containing FRAC 3 fungicides are the best options. Combining sulfur (4–6 lb/A) with fungicides used for scab control is also an option. **DO NOT** mix sulfur with Elast.

ZONATE LEAF SPOT: For zonate leaf spot, the scab fungicide program can be adjusted if needed. The FRAC Group 3 fungicides or mixes containing FRAC 3 fungicides are the best options. Topsin M also provides suppression of Zonate leaf spot.

ANTHRACNOSE: Anthracnose is a disease with a long latent period; symptom expression occurs many weeks after infection. Fungicides used for control of scab have been effective in suppressing anthracnose, particularly FRAC Groups 3 and 11 and the phosphorous acid-based fungicides

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

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

AFTER SHELL HARDENING: Fungicide coverage for crop protection is necessary to shell hardening. Beginning in early August, monitor for shell hardening and adjust fungicide needs accordingly.

FOLIAR DISEASES: Maintaining leaf health past shell hardening is important. If leaf scab, zonate leaf spot, or another foliar disease is of concern, refer to the previous sections for fungicide options and recommendations. Pay attention to use limitations and fungicide resistance management guidelines. **DO NOT** use Topsin in consecutive applications for leaf disease control.

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
Phytophthora Shuck and Kernel Rot	A treatment is advised in orchards with a history of this disease (primarily Houston, Peach, and Macon counties) during periods of extended wetness and moderate temperatures (< 86°F) occurring between shell hardening and shuck split.				
	TPTH	30	full rate		
	phosphorous acid Fosphite, KPhite Phiticide, Phostrol Rampart	33	full rate	4 H/ —	The phosphite (phosphorous acid based) fungicides listed are EPA approved and considered to be very safe products. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season.
	MOA Group 11 fungicides	11	full rate		
	copper hydroxide Kocide 3000 Kocide 2000	M1	0.75–1.75 lb 1.5–3 lb	48 H/ —	Use higher rates when disease pressure is high and large, mature trees.

COMMERCIAL PECAN WEED CONTROL

FRUIT AND NUTS

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/ PHI	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PRE-EMERGENCE					
<i>oryzalin</i> Surflan 4AS <i>Oryzalin</i> 4AS	3	2–6 qt	2–6	24 H/ not listed	Use on non-bearing and bearing trees for control of annual grasses and small seeded broadleaf weeds. Use low rate for short-term control (2–4 months); high rate for long-term control (8–12 months). DO NOT apply to newly transplanted trees until soil has settled and no cracks are present. Apply before annual weeds emerge in the spring or add <i>paraquat</i> or <i>glyphosate</i> 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 XP or Diuron 80DF Direx or Diuron 4L other brands	7	2–4 lb 1.6–3.2 qt	1.6–3.2	12 H/ not listed	Use for control of annual broadleaf weeds and some annual grasses only under trees established in the orchard at least 3 years. Apply in spring before annual weeds emerge; if weeds are present, include surfactant to improve contact activity. Make a single band or broadcast application as a directed spray. Use low rate on sandy loam soils. DO NOT use on sand, loamy sand, gravelly soils, or on exposed subsoils. DO NOT use on soils with less than 0.5% organic matter. DO NOT graze treated areas. Add <i>paraquat</i> , <i>glufosinate</i> , or <i>glyphosate</i> for enhanced control of emerged weeds.
<i>simazine</i> Princep, <i>Simazine</i> 90DF Princep, <i>Simazine</i> 4F	5	2.2–4.4 lb 2–4 qt	2–4	48 H/ 21 D	Use for control of annual broadleaf weeds and some annual grasses only under trees established for at least 2 years. Provides good control of annual ryegrass. Use low rates on sandy soils. DO NOT apply to gravelly, sand, or loamy sand soils. DO NOT apply when nuts are on the ground. DO NOT graze treated areas. Add <i>paraquat</i> , <i>glufosinate</i> , or <i>glyphosate</i> for control of emerged weeds.
<i>oryzalin</i> Surflan 4AS <i>Oryzalin</i> 4AS + <i>simazine</i> Princep, <i>Simazine</i> 80W 90DG 4L		2–4 qt + 2.5–5 lb 2.2–4.4 lb 2–4 qt	2–4 + 2–4	24 H/ not listed 48 H/ 21 D	Use for broad spectrum annual grass and broadleaf weed control. Provides good control of annual ryegrass. <i>Paraquat</i> , <i>glufosinate</i> , or <i>glyphosate</i> 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	12 H/ 60 D 24 H/ 60 D	Use for broad spectrum annual grass and broad leaf weed control only under trees established in the orchard for at least 3 years. Apply in the spring before annual weeds emerge. See remarks and precautions for each product.
<i>pendimethalin</i> Prowl H ₂ O 4EC Prowl or Pendimethalin 3.3EC	3	2–6 qt 2.4–7.3 qt	2–6	24 H/ 60 D	Control of annual grasses and broadleaf weeds such as pigweed. Most effective when adequate rainfall or irrigation is received within 7 days after application. DO NOT apply to newly transplanted trees until ground has settled around roots. Sequential applications may be used as long as total use rate does not exceed 6 qt/A and there are 30 days between applications. Prowl H ₂ O has a 60 day PHI for pecans; however, other <i>pendimethalin</i> formulations can only be used in non-bearing pecans.
<i>norflurazon</i> Solicam 80DF	12	2.5–5 lb	2–4	12 H/ 60 D	Use for control of annual grasses, broadleaf weeds, and suppression of some perennials under bearing, non-bearing, or newly set trees. Apply to newly planted trees only after soil has settled around roots, at least 6 months after planting. Avoid contact with roots. Apply in the fall or early spring-fall applications control a broader weed spectrum than spring applications. DO NOT apply when nuts are on the ground at harvest. Use low rate on coarse-textured soils, higher rates on fine-textured soils. Make only 1 application per year. DO NOT graze treated areas. May tank mix with <i>simazine</i> or <i>diuron</i> for broader spectrum weed control. Add <i>paraquat</i> , <i>glufosinate</i> , or <i>glyphosate</i> for control of emerged weeds. DO NOT apply within 60 days of harvest. Sequential applications can be used so long as total use rate does not exceed maximum use rate for soil texture and crop.

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/ PHI	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PRE-EMERGENCE (continued)					
<i>rimsulfuron</i> Matrix 25WG Solida 25WG Pruvin 25WG Grapple 25 WG	2	4 oz	0.063	4 H/ 14 D	Provide pre- and post-control of broadleaf and annual grass weeds (see label for weed control POST). For broad spectrum residual control tank mix with <i>diuron</i> , <i>oryzalin</i> , or Prowl H ₂ O. Use in orchards established at least 1 year. <i>Rimsulfuron</i> has a 14-day PHI for pecan. Sequential applications may be used so long as there are 30 days between applications and total use rate does not exceed 4 oz/A broadcast basis.
<i>flumioxazin</i> Chateau 51WDG Tuscany 51 WDG Tuscany 4 SC	14	6–12 oz	0.19–0.38	12 H/ 60 D	DO NOT apply more than 6 oz/A/application to soils having a sand and/or gravel content >80%. Trees established less than 1 year must be shielded with a grow tube or waxed container. DO NOT apply second application within 30 days of initial application. Applications after bud break can only be made with shielded application equipment. Once trees break dormancy apply with <i>paraquat</i> or <i>glufosinate</i> for non-selective post-emergence control. Must use shielded application equipment if using in non-dormant pecan trees. <i>Flumioxazin</i> has a 60-day PHI for pecans.
<i>penoxsulam</i> + <i>oxyfluorfen</i> Pindar GT	2 + 14	1.5–3 pt	0.75–1.50	24 H/ 60 D	Apply Pindar GT to pecan trees that have been planted at least 9 months and longer. Use trunk guards to protect plants until adequate mature bark has developed. Can be used as a bearing and non-bearing dormant application. Non-bearing are those trees which will not bear a crop within one year after treatment. Applications can be made beginning after pecan harvest up to emergence of green leaf tissue the following season. For best results, apply prior to weed emergence of broadleaf and grass species. Do not apply more than 4.5 pts per acre per year. Tank mix with <i>oryzalin</i> or <i>pendimethalin</i> for expanded redual control of annual grasses. See label for use rate restrictions.
<i>indaziflam</i> Alion 1.67SE	29	3.5–6.5 oz	0.045–0.085	12 H/ 14 D	Use in orchards established 3 years or longer. Sequential applications may be used as long as there are 90 days between applications and total use rate does not exceed 10.3 oz/A/year. Use rate cannot exceed 3.5 fl oz/A/application on soils having less than 1% organic matter. On soils with an organic matter content from 1–3%, no more than 5 fl oz/A can be applied in a single application and the total use rate for the year cannot exceed 8.5 fl oz/A. In order to apply more than 5 fl oz/A in a single application soil organic matter must be > 3%. Alion should be tank mixed with <i>glyphosate</i> , <i>glufosinate</i> , or <i>paraquat</i> for non-selective post-weed control. Alion has a 14-day PHI. Do not use on soils having a 20% or greater gravel content. Do not treat soil around trees with cracks or channels, or with depressions.
POST-EMERGENCE					
<i>2,4-D amine</i> Various generic formulations 3.8SL	4	2–3 pt	0.8–1.2	48 H/ 60 D	DO NOT apply more than twice a year or within 60 days of harvest. Trees must be at least 1 year old. DO NOT allow spray to drift onto or contact foliage, fruit, stems, or trunks of trees. DO NOT apply to bare ground. DO NOT apply on light, sandy soils. Past research has shown concerns of injury when applying <i>2,4-D</i> 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 <i>2,4-D</i> . Certain crops, like cotton and vegetables, can be severely injured by <i>2,4-D</i> 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.
<i>2,4-D choline</i> Embed Extra	4	1–4 pt	0.4–1.8	48 H/ 60 D	Embed Extra contains the same active ingredient used on <i>2,4-D</i> tolerant crops. Use only orchards established at least 1 year or longer. DO NOT apply within two weeks either side of bloom. Embed Extra has a 60 day PHI for pecan. Do not use on sandy or loamy sand soils. Allow 75 days between sequential applications. DO NOT allow spray to drift onto or contact foliage, fruit, stems, or trunks of trees.
<i>fluazifop</i> Fusilade DX 2EC 2 lb/gal	1	8–24 fl oz	0.125–0.38	12 H/ 30 D	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 nutsedge(s). DO NOT apply when harvestable nuts are on the ground. DO NOT graze treated area. DO NOT apply within 30 days of harvest.

COMMERCIAL PECAN WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/ PHI	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POST-EMERGENCE (continued)					
sethoxydim Poast 1.5EC 1.5 lb/gal	1	1–2.5 pt	0.3–0.5	12 H/ 15 D	Use for control of annual and perennial grasses. Sequential applications will be necessary for control of perennial grass weeds like bermudagrass and johnsongrass. Low spray volumes (10 GPA) generally improve control. Add crop oil concentrate (1 qt/A). Use low rate on annual grasses up to 6" tall; higher rates on larger annual grasses and perennial grasses. Does not control nutsedge. DO NOT harvest within 15 days of application.
<i>clethodim</i> Select 2.0EC and various brands	1	6–8 fl oz		24 H/ 15 D	Use for control of annual and perennial grasses in NON-BEARING trees that will not be harvested within 1 year of application. Use higher rates and sequential applications for perennial grasses. Add a non-ionic surfactant containing at least 80% ai at a rate of 1 qt/100 gal of spray solution (0.25% v/v). Make application to johnsongrass: 12–18" tall; bermudagrass: 3" tall or with 4–8" runners; annual grasses: 2–8" tall. Does not control nutsedge.
Select Max 1 lb/gal					
Intensity One 1 lb/gal		12–16 oz			
<i>halosulfuron</i> Sanda 75WDG	2	0.67–1.33 oz	0.032–0.063	12 H/ 1 D	For control of nutsedge, pigweed, radish, and cocklebur. Apply as directed spray under trees established for at least 1 year. Avoid contact of spray with trunk, stem, roots, or tree foliage. May apply up to 2 applications. DO NOT apply within 1 day of harvest. See label for rate restrictions related to soil texture. Tank mix with <i>glyphosate</i> for broad spectrum control
<i>paraquat</i> Firestorm 3SL Gramoxone 3SL Parazone <i>Paraquat</i> Concentrate 3 lb/gal	22	1.75–2.7 pt	0.65–1	24 H/ Prior to shaking for harvest	Use for broad spectrum, contact control of emerged weeds. Apply as a directed spray in at least 20 gal of water with 1–2 pt surfactant/100 gal of spray mix or 1% crop oil concentrate (1 gal/100 gal spray mix). Apply when annual weeds are succulent and 1–6" tall. DO NOT allow spray drift to contact foliage or green bark of trees since severe damage may occur. DO NOT allow animals to graze on treated areas. May be tank mixed with certain pre-emergence herbicides for effective residual weed control. DO NOT apply when nuts are on the ground.
Gramoxone SL 2 lb/gal		2–4 pt			
<i>glufosinate</i> Cheetah, Reckon, Rely, Lifeline, or Surmise 2.34 lb/gal	10	48 fl oz	0.88–1.5	12 H/ 14 D	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 limits systemic activity, but does well on wild brambles and perennial grasses. Does not have soil residual activity. DO NOT contact foliage or green bark. <i>Glufosinate</i> formulations are loaded with surfactant therefore NO additional nonionic surfactants or crop oil is needed. The addition of spray graded <i>ammonium sulfate</i> fertilizer at 8–10 lb/100 gal will enhance <i>glufosinate</i> activity.
<i>glyphosate</i> multiple formulations	9	Consult label for rate	0.75–2.5	4 H/ 3 D	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. Systemic activity of <i>glyphosate</i> has the potential to cause significant injury if contact occurs with trees. Does not have soil residual activity. DO NOT contact foliage or green bark. <i>Glyphosate</i> formulations are loaded with surfactant therefore NO additional nonionic surfactants or crop oil is needed. The addition of spray graded <i>ammonium sulfate</i> fertilizer at 8–10 lb/100 gal will enhance <i>glyphosate</i> activity.

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		
PRE-PLANT (PLASTICULTURE)					
<i>carfentrazone</i> Aim EC 2EC Aim EW 1.9EW	14	0.8–1.5 fl oz	0.013–0.023	12 H	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	27	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.
Other fumigation options					The fumigant methyl bromide has been phased out and other fumigates are being used 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.
PRE-EMERGENCE^{1,2,3} (PLASTICULTURE)					
<i>acifluorfen</i> Ultra Blazer 2 L	14	1.5 pt	0.375	— / 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. Post-harvest interval is 60 days.
<i>DCPA</i> Dacthal W-75	3	8–12 lb	6–9	12 H	Control of most annual grasses and small-seeded broadleaf weeds. Also, controls volunteer small grains if applied before emergence. Apply as a banded pre-emergence treatment to the middles between plastic before weed emergence. A tank mixture with <i>paraquat</i> 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	14	3 oz/A	0.09	12 H	Excellent product for pre-emergence 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. Do not apply more than 3 oz/A/year.
<i>napropamide</i> Devrinol 50DF	15	4–8 lb	2–4 lb	12 H	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. DO NOT apply from bloom to harvest.
<i>oxyfluorfen</i> Goal 2XL	14	1–2 pt	0.25–0.5	12 H	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.

1. All pre-emergent 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 pre-emergent herbicide application, weed control can be extremely poor.
2. Most pre-emergent herbicides will only control germinating weed seed. Generally, pre-emergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most pre-emergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).
3. 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		
PRE-EMERGENCE^{1,2,3} (PLASTICULTURE) (continued)					
<i>sulfentrazone</i> Zeus 4 L	14	3–6 oz	0.094–0.1885	12 H/	For annual strawberries, apply to soil surface before laying plastic mulch (DO NOT 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. DO NOT exceed 12 oz pr/A in a growing season.
<i>terbacil</i> Sinbar 80 WDG	5	2–4 oz	1.6–3.2	12 H/	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.
POST-EMERGENCE (PLASTICULTURE)					
<i>2,4-D</i> Weedar 64	4	2–3 pt	1 to 1.5	48 H/ 30 D	Good at controlling many emerged broadleaf weeds. Apply only to established plants. Apply to in early spring when strawberry plants are dormant or immediately after last pick. One application per crop cycle. Do not exceed 1.5 lb ai/A (3 pt) per year.
<i>acifluorfen</i> Blazer 1.5	14	1.5 pt	0.375	48 H / 60 D	Can make a maximum of two 1.5 pt applications a year. Make band application before laying plastic. Can use in-between plastic with shielded sprayer.
<i>carfentrazone</i> Aim EC 2.0 EC Aim EW 1.9 EW	14	2 fl oz	0.031	12 H/	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	1	6–8 fl oz	0.094–0.125	12 H/ 4 D	Apply post-emergence 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. DO NOT apply within 4 days of harvest.
<i>clopyralid</i> Stinger 3 lb/gal	4	5.3 fl oz	0.124	12 H/ 30 D	DO NOT use a surfactant. DO NOT tank mix with other herbicides. DO NOT apply within 30 days of harvest. 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>fluazifop-p</i> Fusilade DX 2EC	1	16–24 fl oz	0.25–0.38	— / 14 D	Controls annual and perennial grasses after they have emerged. Sequential applications will be necessary for perennial grass control. Crop oil concentrate (1 qt/A) will enhance weed control as compared to non-ionic surfactants, but non-ionic surfactants provided more safety to young plants. Make application to johnsongrass: 12–18" tall; bermudagrass: 3" tall or with 4–8" runners; annual grasses: 2–8" tall. Does not control nutsedge. DO NOT apply more than one application per year.

1. All pre-emergent 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 pre-emergent herbicide application, weed control can be extremely poor.
2. Most pre-emergent herbicides will only control germinating weed seed. Generally, pre-emergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most pre-emergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).
3. 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).

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POST-EMERGENCE (PLASTICULTURE) (continued)					
<i>paraquat</i> Gramoxone 2.0 SL Other formulations	22	2 pt	0.5	12 H/ 21 D	For burndown of weeds in plasticulture allies. DO NOT apply more than 3 times/year (6 pts/season). Post-harvest interval is 21 days. Coverage is essential for weed control. DO NOT 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	1.5–2.5 pt	0.18–0.47	12 H/ 7 D	Use for control of emerged annual and perennial grasses. Apply to actively growing grasses at least 7 days prior to harvest . 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. DO NOT 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.
POST-EMERGENCE HOODED OR SHIELDED APPLICATIONS (PLASTICULTURE)					
<i>carfentrazone</i> Aim EC 2EC Aim EW 1.9EW	14	0.5–1.6 fl oz	0.008–0.025	12 H	For control of annual broadleaf weeds including morningglory, pigweed, and spiderwort. Apply as a hooded spray in row middles. DO NOT 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 <i>glyphosate</i> .
<i>flumioxazin</i> Chateau 51WDG	14	3 oz	0.09	12 H	Excellent pre-emergence 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. DO NOT apply more than 3 oz/A/year .
<i>paraquat</i> Gramoxone Inteon 2SL	22	2 pt	0.62	12 H/ 21 D	Contact kill of emerged broadleaf and grass weeds, using shields and direct spray to row middles to prevent contact with strawberry foliage . 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. DO NOT apply Gramoxone within 21 days of harvest . DO NOT make more than 3 applications per season. DO NOT graze livestock in treated areas.
<i>glyphosate</i> Various trade names and formulations	9	See label	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, DO NOT let herbicide contact foliage, green shoots or stems, exposed roots, or fruit of crop. May make 3 applications per year.
PRE-EMERGENCE^{1,2,3} (MATTED ROW)					
<i>2,4-D</i> Weedar 64	4	2–3 pt	1 to 1.5	48 H/ 30 D	Good at controlling many emerged broadleaf weeds. Apply only to established plants. Apply to in early spring when strawberry plants are dormant or immediately after last pick. One application per crop cycle. Do not exceed 1.5 lb ai/A (3 pt) per year.
<i>carfentrazone</i> Aim EC 2.0EC Aim EW 1.9EW	14	0.8–1.5 fl oz	0.013–0.023	48 H/ 30 D	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.

1. All pre-emergent 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 pre-emergent herbicide application, weed control can be extremely poor.
2. Most pre-emergent herbicides will only control germinating weed seed. Generally, pre-emergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most pre-emergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).
3. 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		
PRE-EMERGENCE^{1,2,3} (MATTED ROW) (continued)					
<i>DCEPA</i> Dacthal W-75	3	8–12 lb	6–9	12 H	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 pre-emergence weed control. DO NOT apply after first bloom through harvest.
<i>flumioxazin</i> Chateau 51WDG	14	3.0 oz	0.09	12 H	Excellent product for pre-emergence 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 post-emergence weed control. DO NOT apply more than 3 oz/A/year.
<i>napropamide</i> Devrinol 50DF	15	4–8 lb	2–4	12 H	For control of most annual grasses and small-seeded broadleaf weeds. Delay application until desired number of daughter plants have become established. DO NOT apply from bloom through harvest. Irrigation or mechanical incorporation is essential for activation.
<i>clethodim</i> Select 2EC	1	6–8 fl oz	0.09–0.125	12 H/ 4 D	Post-emergence 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). DO NOT apply within 4 days of harvest and DO NOT apply more than 8 oz per application.
<i>clethodim</i> Select Max 0.97EC	1	9–16 fl oz	0.068–0.121	12 H	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).
POST-EMERGENCE (MATTED ROW)					
<i>clopyralid</i> Stinger 3 lb/gal	4	5.3–10.6 fl oz	0.248	—/ 30 D	DO NOT use a surfactant. DO NOT tank mix with other herbicides. DO NOT apply within 30 days of harvest. Make 1–2 applications per 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>fluazifop-p</i> Fusilade DX 2EC	1	16–24 fl oz	0.25–0.38	—/ 14 D	Controls annual and perennial grasses after they have emerged. Sequential applications will be necessary for perennial grass control. Crop oil concentrate (1 qt/A) will enhance weed control as compared to non-ionic surfactants, but non-ionic surfactants provided more safety to young plants. Make application to johnsongrass: 12–18" tall; bermudagrass: 3" tall or with 4–8" runners; annual grasses: 2–8" tall. Does not control nutsedge. DO NOT apply more than one application per year.
<i>sethoxydim</i> Poast 1.5EC	1	1.5–2.5 pt	0.18–0.47	—/ 7 D	Post-emergence grass control. Consult label for specific rates and best times to treat. Add 1 qt of crop oil concentrate per acre. DO NOT apply on days that are unusually hot and humid. DO NOT apply within 7 days of harvest.

1. All pre-emergent 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 pre-emergent herbicide application, weed control can be extremely poor.
2. Most pre-emergent herbicides will only control germinating weed seed. Generally, pre-emergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most pre-emergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).
3. 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).

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POST-EMERGENCE HOODED OR SHIELDED APPLICATIONS (MATTED ROW)					
<i>acifluorfen</i> Blazer 1.5	15	1.5 pt	0.375	48 H/ 60 D	Can make a maximum of two 1.5 pt applications a year. Make over-the top applications after last harvest, and when strawberry plants are dormant. Do not apply last application within 120 days of strawberry harvest.
<i>carfentrazone</i> Aim EC 2EC Aim EW 1.9EW	14	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. DO NOT 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 <i>glyphosate</i> .
<i>glyphosate</i> Various trade names and formulations	9	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, DO NOT let herbicide contact foliage, green shoots or stems, exposed roots, or fruit of crop.
<i>paraquat</i> Gramoxone Inteon 2SL Other formulations	22	2 pt	0.62	—/ 21 D	Contact kill of emerged broadleaf and grass weeds using shields and direct spray between the rows to prevent contact with strawberry foliage. 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. DO NOT apply Gramoxone within 21 days of harvest. DO NOT make more than 3 applications per season. DO NOT graze livestock in treated areas.

WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS

Wayne E. Mitchem, Extension Weed Scientist

FRUIT AND NUTS

APPLICATION METHOD ¹	ALION		DIURON, ETC.		DEVRIKOL		SOLICAM		SINBAR		PENDIMETHALIN		ORYZALIN		SIMAZINE		TRELLIS	
	PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE	
	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
BIENNIAL AND PERENNIAL WEEDS																		
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
ANNUAL GRASSES																		
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

1. PRE—Pre-emergence.
2. 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

APPLICATION METHOD ¹	ALION		DIURON, ETC.		DEVIRINOL		SOLICAM		SINBAR		PENDIMETHALIN		ORYZALIN		SIMAZINE		TRELIS	
	PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE	
	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
ANNUAL BROADLEAF WEEDS																		
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	
lambquarters	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

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 + 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.

WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS

	FLUMIOXAZIN		ZEUS		OXYFLUORFEN		FUSILADE CLETHODIM ⁺		GLYPHOSATE		PARAQUAT		2,4-D AMINE or CHOLINE		POAST	
	APPLICATION METHOD ¹		PRE		PRE		PDS		PDS		PDS		PDS		PDS	
	TIME OF YEAR ²		S	F	S	F	S	F	S	F	S	F	S	F	S	F
BIENNIAL AND PERENNIAL WEEDS																
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
ANNUAL GRASSES																
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	

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WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS

APPLICATION METHOD ¹	FLUMIOXAZIN		ZEUS		OXYFLUORFEN		FUSILADE CLETHODIM ⁺		GLYPHOSATE		PARAQUAT		2,4-D AMINE or CHOLINE		POAST		TRELLIS	
	PRE		PRE		PRE		PDS		PDS		PDS		PDS		PDS		PDS	
	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
ANNUAL BROADLEAF WEEDS																		
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 ³		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			
lambquarters	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		

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WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS

	AIM		GLUFOSINATE*		VELPAR		SANDEA		BASAGRAN		STINGER		RIMSULFURON		STARANE	
APPLICATION METHOD ¹	PDS		PDS		PRE/PDS		PDS		PDS		PDS		PRE/PDS			
TIME OF YEAR ²	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
BIENNIAL AND PERENNIAL WEEDS																
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											
ANNUAL GRASSES																
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											

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	AIM		GLUFOSINATE*		VELPAR		SANDEA		BASAGRAN		STINGER		RIMSULFURON		STARANE	
APPLICATION METHOD ¹	PDS		PDS		PRE/PDS		PDS		PDS		PDS		PRE/PDS			
TIME OF YEAR ²	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
ANNUAL BROADLEAF WEEDS																
bristly starbur			G	G	G				G							
chickweed			E	E	G	G							G		E	
cocklebur	G		G	G	G		E		E		E		F		E	
crotalaria					G				P							
croton, tropic			G	G	G				G							
evening primrose	F-P		G	G	E	E									G	G
Florida beggarweed			G	G	F						E					
Florida pusley					G											
horseweed			G	G	G	E					E		E		G	G
jimson weed	G				G				E		E					
lambsquarters	E		G	G	G		F		F				F			
morningglories	G		G	G	F		F		F				F		G	
pigweed	G		G	G	G		G		P				E			
prickly lettuce	F				G	G						E			G	G
prickly sida (teaweed)			G	G	F				G							
purslane, common	G		G	G	G				G				G		G	
ragweed, common			G	G	G		E		G		E		F			
sicklepod			G	G	F						E		F		G	
wild radish	F		G	G	G	G	E	E	G	G			E			

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