

FRUIT AND NUTS COMMERCIAL IPM GUIDES

INTEGRATED ORCHARD MANAGEMENT GUIDE FOR COMMERCIAL APPLES IN THE SOUTHEAST

The guide is available electronically at <http://ipm.ncsu.edu/apple/orchardguide/orchard-management-guide.pdf>

BLACKBERRY AND RASPBERRY IPM GUIDE

This guide is available electronically at <http://www.smallfruits.org/SmallFruitsRegGuide/index.htm>

COMMERCIAL BLUEBERRY INSECT AND DISEASE SPRAY GUIDE

This guide is available electronically at <http://www.smallfruits.org/SmallFruitsRegGuide/index.htm>

COMMERCIAL BUNCH GRAPE IPM GUIDE

This guide is available electronically at <http://www.smallfruits.org/SmallFruitsRegGuide/index.htm>

COMMERCIAL MUSCADINE GRAPE INSECT AND DISEASE SPRAY GUIDE

This guide is available electronically at <http://www.smallfruits.org/SmallFruitsRegGuide/index.htm>

COMMERCIAL PEACH, NECTARINE AND PLUM PEST MANAGEMENT AND CULTURE GUIDE

The guide is available at <http://www.ent.uga.edu/peach/PeachGuide.pdf>

COMMERCIAL STRAWBERRY DISEASE AND INSECT CONTROL

This guide is available electronically at <http://www.smallfruits.org/SmallFruitsRegGuide/index.htm>

NOTE: 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.

COMMERCIAL APPLE WEED CONTROL

Wayne E. Mitchem, Extension Associate - Fruit Weed Control

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE			
dichlobenil (Casoron) 4G (Casoron CS) 1.4/gal.	100 to 150 lb 1.4 to 2.8 gal.	4 to 6 2 to 4	Apply to any age tree in January and February. DO NOT apply Casoron 4G until 4 weeks after transplanting. Casoron CS can be tank mixed with glyphosate or paraquat. Casoron CS should only be used in established orchards (at least 1 year after transplanting).
oryzalin (Surflan) 4AS 4.0 lb/gal (oryzalin) 4.0 lb/gal	2.0 to 6.0 qt	2.0 to 6.0	Use on non-bearing and bearing trees for control of annual grasses and small seeded broadleaf weeds. Use low rate for short term control (2 to 4 months); high rate for long-term control (6 to 8 months). <u>DO NOT</u> apply to newly transplanted trees until soil has settled and no cracks are present. Apply before annual weeds emerge in the spring or add paraquat or glyphosate for control of emerged weeds. For broadspectrum preemergence broadleaf weed control tank mix with simazine. Sequential applications may be used so long as total use rate does not exceed 12 qt/A per year.
oxyfluorfen (Goal 2 XL) (Galigan) 2E (Oxiflo) 2 EC 2.0 lb/gal (Goal Tender) 4EC 4.0 lb/gal	5.0 to 8.0 pts 2.5 to 4.0 pts.	1.25 to 2.0	Apply after final harvest until bud swell. DO NOT apply when foliage or fruit are present. Do not apply more than 8 pts. in a growing season. May be tank mixed with glyphosate, paraquat, Surflan, or Solicam.
flumioxazin (Chateau) 51WDG	6 to 12 ozs.	0.19 to 0.38	DO NOT use more than 6 ozs./A per application on soils having >80% sand and/or gravel content. Trees planted less than 1 year must be protected with non-porous wrap, or a waxed container. DO NOT apply a second application within 30 days of initial application. An initial application of Chateau at 6 to 8 ozs./A followed by second application of 6 to 8 ozs./A when initial control fails has proven effective in research plots. Applications after leaf out should be only tank mixed with paraquat or Rely. In bearing orchards DO NOT apply Chateau before completion of final harvest or after pink bud stage. The PHI is 60 days.
diuron (Karmex, Karmex XP, Diuron) 80DF (Direx or Diuron) 4L	2.0 to 3.0 lb 1.6 to 2.4 qt.	1.6 to 2.4	Use for control of annual broadleaf weeds under trees established in the orchard for at least 1 year. Do not treat varieties grafted on full-dwarf rootstocks. For apples, a spring and fall treatment (Karmex only) may be applied (1.6 lb AI/A/application) to broaden the spectrum of weeds controlled. When using sequential applications allow at least 90 days between applications. Fall treatment of diuron (Karmex only) may be made any time after harvest (Georgia state label). <u>DO NOT</u> use on sand, loamy sand, gravelly soils, exposed subsoils, or on soils with less than 1% organic matter. Apply in combination with glyphosate, paraquat, Rely for control of emerged weeds.
indaziflam (Alion) 1.67SC	5 to 6.5 fl ox	0.065 to 0.085	Alion will provide PRE control of annual broadleaf and grass weeds. Alion may be used in orchards established 3 yrs. or more. Allow 90 days between sequential applications. Do not use in orchards where open channels or cracks in soil are present. Do not apply more than 10.3 oz/A per year. Alion has a 14 day PHI. Tank mix with glyphosate, Rely, or paraquat for non-selective POST weed control.
simazine (Princep, Simazine) 90DG (Princep, Simazine) 4L	2.2 to 4.4 lb 2.0 to 4.0 qt	2.0 to 4.0	Use for control of annual broadleaf weeds under trees established in the orchard for at least 1 year. Use the low rate on coarse textured soils. <u>DO NOT</u> apply to gravelly, sand, or loamy sand soils. Add paraquat or glyphosate for control of emerged weeds. Simazine has a 150 day PHI. For expanded residual control tank mix with oryzalin or Solicam
oryzalin (Surflan) 4 AS 4.0 lb/gal (oryzalin) 4.0 lb/gal + simazine (Princep, Simazine) 90DG (Princep, Simazine) 4 L	2.0 to 4.0 qt + 2.2 to 4.4 lb 2.0 qt to 40 qt	2.0 to 4.0 + 2.0 to 4.0	Use for broad spectrum annual grass and broadleaf weed control under trees established in the orchard for at least 1 year. Apply in the spring before annual weeds emerge. <u>DO NOT</u> apply to gravelly, sand, or loamy sand soils. Add paraquat or glyphosate for control of emerged weeds.

COMMERCIAL APPLE WEED CONTROL (continued)

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE (cont.)			
rimsulfuron (Matrix) 25 WG (Solida) 25WG (Pruvin) 25WG	4 oz.	0.063	For broadspectrum residual control tank mix with diuron, Sinbar, oryzalin or Prowl H ₂ O. The addition glyphosate or paraquat is necessary for broadspectrum control of emerged weeds. Trees must be established for 1 year or more. Rimsulfuron have a 7 day PHI for apples. Rimsulfuron may be applied as a sequential application so long as total use rate does not exceed 4 oz. per year and application is made in band on <50% of orchard floor.. Allow 30 days between applications.
terbacil (Sinbar) 80WP or 80WDG	0.5 to 1.0 lb.	0.4 to 0.8	Newly Planted Orchards: Apply once soil has settled after transplanting. Apply no more than 1 lb. per acre per year. Best results have been obtained when 0.5 lb. applied in spring followed by another 0.5 lb. when control from initial application fails. Do not use on soils coarser than sandy loam or with <1% organic matter.
terbacil (Sinbar) 80W or 80WDG	2.0 to 4.0 lb	1.6 to 3.2	Use for annual weed control and perennial broad leaf weed control/ suppression. Use ONLY under apple trees established in the orchard for at least 3 years. SINBAR IS NOT LABELED FOR USE PEARS. Apply in the spring or after harvest in the fall. Some chlorosis of weakened trees may occur. Control of established perennial weeds may be erratic. DO NOT use on sand, loamy sand, gravelly soils, or on eroded areas where subsoil or tree roots are exposed. DO NOT use on any soil with less than 1% organic matter. Use rate should not exceed 3 lbs. unless soil organic matter is >2%. Apply in combination with glyphosate, Rely, or paraquat for control of emerged weeds.
noflurazon (solicam) 80DF + simazine (Princep, Simazine) 90DG (Princep, Simazine) 4L	2.5 to 5.0 lb. + 2.2 to 4.4 lb. 2.0 to 4.0 qt.	2.0 to 4.0 + 2.0 to 4.0	Use for broadspectrum preemergence weed control. Do not use on trees established in the orchard less than 1 year. Do not use on sand, loamy soils or gravelly soils. Tank mix with paraquat, Rely, or glyphosate for control of emerged weeds.
diuron (Karmex, Diuron) 80DF (Direx) 4L + terbacil (Sinbar) 80 W	1.0 to 2.0 lb 1.6 to 3.2 pt. + 1.0 lb	0.8 to 1.6 + 0.8	Use for broad spectrum weed control ONLY under apple trees established in the orchard at least 2 years. THIS TANK MIX IS NOT LABELED FOR USE ON PEARS. Apply in spring or after harvest in the fall before weeds emerge or to weeds less than 2 in. tall. Research has shown this tank mix provides a longer period of weed control and controls a broader weed spectrum than either component herbicide used alone. DO NOT use on sand, loamy sand, gravelly soils, or on eroded areas where subsoil or tree roots are exposed. DO NOT use on any soil with less than 1% organic matter. DO NOT use on trees grafted on full-dwarf rootstocks.
pendimethalin (Prowl H ₂ O) 4 lb/gal.	2 to 4 qt.	2.0 to 4.0	Use for control of annual grasses and small seeded broadleaf weeds. DO NOT apply to newly planted trees until the soil has settled and no cracks are present. Apply before annual weeds emerge in the spring. Adequate rain fall or sprinkler irrigation within 7 days of application is required for effective control. Add paraquat or glyphosate for control of emerged weeds. Prowl H ₂ O has a 60 day PHI. Prowl may be applied as a sequential application so long as total use rate does not exceed 4 qt. per acre.
norflurazon (Solicam) 80DF	2.5 to 5.0 lb	2.0 to 4.0	Use for control of annual grasses, broadleaf weeds, and suppression of some perennials. Can be applied to newly planted or established apple trees. Pear trees should be established at least 1 year prior to use. Apply to soil that is firm and free of depressions in which rain or irrigation water could accumulate. Rate is soil texture dependent. May be tank mixed with simazine or Karmex for broader spectrum weed control. Add paraquat or glyphosate for control of emerged weeds. DO NOT apply within 60 days of harvests. Multiple applications may be used so long as total use rate does not exceed maximum use rate for soil texture and crop.

COMMERCIAL APPLE WEED CONTROL (continued)

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE			
fluazifop (Fusilade DX) 2.0 lb/gal	0.75 to 1.5 pt	0.25 to 0.375	Use for control of annual and perennial grasses in NON-BEARING trees that will not be harvested within 1 year of application. Low spray volumes (10 gpa) generally improve control. Add crop oil concentrate (1 qt/A). Make application to johnsongrass -12 to 18 in. tall; bermudagrass-3 in. tall or with 4 to 8 runners; annual grasses - 2 to 8 in. tall. Does not control nutsedge(s).
clethodim (Select) 2.0 lb/gal (Arrow) (Intensity) (Select Max) (Intensity One)	6 to 8 oz. 1.0 lb/gal 12 to 16 oz.	0.094 to 0.125	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 for perennial grasses. The addition of a non-ionic surfactant at 0.25% v/v (1 qt. per 100 gal. of spray solution). Make application to johnsongrass-12 to 18 in. tall; bermudagrass-3 in. tall or with 4 to 8 runners; annual grasses - 2 to 8 in. tall. Does not control nutsedge(s). Sequential applications may be necessary to control perennial grass weeds.
sethoxydim (Poast) 1.5 lb/gal	1.0 to 2.5 pt	0.19 to 0.47	Use for control of annual and perennial grasses in BEARING or non-bearing trees. Low spray volumes (10 gpa) generally improve control. Add crop oil concentrate (1 qt/ A). Use lower rates on annual grasses up to 6 in. tall; higher rates on larger annual grasses and perennial grasses. DO NOT treat within 14 days of harvest. Does not control nutsedge(s). Sequential applications may be necessary to control perennial grass weeds.
2,4-D amine (Various generic formulations) 3.85 lb/gal	2 to 3 pts.	0.9 to 1.5	Use for control of actively growing broadleaf weeds. DO NOT apply to bare soil or immediately before rainfall or irrigation. Avoid drift and keep spray off trunk and foliage. DO NOT spray during apple bloom or within 14 days of harvest. DO NOT apply to newly established trees. Some formulations limit rate to 2 pt/A.
paraquat (Parazone) (Paraquat Concentrate) (Firestorm) 3 lbs/gal (Gramoxone SL) 2 lbs/gal	1.75 to 2.7 pts. 2.5 to 4 pts.	0.6 to 1.0	Use for broad spectrum, contact control of emerged weeds. Apply as a directed spray in high spray volumes (20+ gpa) with 1 qt surfactant/100 gal of spray solution. Apply when broadleaf weeds and annual grasses are succulent and 1 to 6 in. tall. Repeat applications as necessary to control weeds. DO NOT allow spray drift to contact foliage or green bark of trees since severe damage may occur. May be tank mixed with certain preemergence herbicides to provide postemergence and residual weed control.
glufosinate (Rely 280) 2.34 lb/gal	48 to 82 ozs.	0.88 to 1.5	Use for broad-spectrum control of emerged weeds and grasses, both annuals and perennials in apples only . Apply as a directed spray in high volumes (20 +GPA) on non-bearing and bearing trees. Possess contact and limited systemic activity, but does well on wild brambles and certain grasses. Does not have soil residual activity. Can also be used for sucker control, spray before sucker reaches 12 inches in length. DO NOT allow spray drift to contact foliage or green bark of trees since severe damage may occur. May be tank mixed with certain preemergence herbicides to provide postemergence and residual weed control. DO NOT apply within 1 year of transplanting. Rely has a 14 day PHI. The addition of ammonium sulfate will enhance Rely activity on difficult to control species.
glyphosate Various brands and formulations	See label for detailed rate information.	0.75 to 2.0	Use for broad spectrum control of emerged weeds, both annuals and perennials. Some difficult to control perennial weeds may require higher rates. Refer to label for rate and application timing for perennial weed. Generic glyphosate formulations may require additional surfactant for optimum results. Applying glyphosate in spray volumes of 25 gal/A or less is recommended for optimum results. Apply as a directed spray under bearing and non-bearing trees. DO NOT allow spray to contact foliage or green bark of trees. Use low rate for control of annual weeds less than 12 in. tall. Allow a minimum of 14 days between last application and harvest. May be tank mixed with certain preemergence herbicides to provide postemergence and residual weed control. Reduced rates may be used to suppress the growth of perennial grass sod between rows. See label for details. Applications made after June should be done for spot treatment of perennial weeds only. Risk for tree injury is greater in the late summer and fall.
glyphosate + carfentrazone (Rage)	20 to 99 ozs.	0.78 to 3.8	Apply as a directed spray for nonselective POST weed control. Use hooded or shielded application equipment. The addition of a non-ionic surfactant or crop oil is necessary. Adding 2 to 4 lb. of ammonium sulfate per acre will enhance control. This product contains glyphosate therefore all concerns with glyphosate products should be observed when using Rage. Rage has a 3 day PHI.

COMMERCIAL APPLE WEED CONTROL (continued)

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE (cont.)			
bentazon (Basagran) 4.0 lb/gal	1.5 to 2.0 pt.	0.75 to 1.0	For use in NON-BEARING apple and pear orchards ONLY. Basagran will provide POST control of certain broadleaf weeds and yellow nutsedge. For yellow nutsedge control, apply 2 pts to plants 6-8" tall. A second application 7-10 days later may be necessary. Include crop oil concentrate at a rate of 2 pt/A. Apply in a spray volume to 20 to 30 gal/A.
Carfentrazone (Aim) 2 lb/gal	0.5 to 2.0 oz.	0.008 to 0.031	Apply alone or tank mix with other herbicides for postemergence control of broadleaf weeds including pigweed, morningglory, lambsquarters and prickly lettuce. Do not allow Aim to contact desirable foliage, flowers, or fruit. Contact with fruit will result in spotting. Do not apply within 3 days of harvest. Best results obtained when applied to weeds in the 2 to 3 leaf stage. Apply in combination with a non-ionic surfactant (1 qt/100 gal of spray solution) or crop oil concentrate (1 gal/ 100 gal of spray solution).
Fluroxypyr (Starane Ultra) 2.8 (Comet) 1.5	0.7 to 1.4 pt. 0.66 to 2.66 pt.	0.35 to 0.7	Apply in minimum spray volume of 10 gal. per acre and when temperatures are between 50 and 80/F. Do not exceed a total use rate of 1.4 pt/A per year. Trees must be established for at least 4 years. Do not apply during bloom. Do not apply within 14 days of harvest. Avoid spray solution contact with foliage. Research in NC has shown fluroxypyr provides good to excellent control of black berry, Virginia creeper, and poison ivy.
Halosulfuron (Sanda) 70WE	0.5 to 1 oz	0.024 to 0.047	Apply halosulfuron to actively growing weeds. Do not use in orchards established <1 year. Do not apply more than 2 oz/A per 12 month period. Avoid herbicide contact with tree foliage. The addition of a non-ionic surfactant is necessary for optimum herbicide performance. Sequential applications are more effective on nutsedge than one application. Tank mix w/ glyphosate for broad spectrum POST weed control.
Salflufenacil (TreeVix)	1 oz	0.044	TreeVix is a POST herbicide that provides excellent control of horseweed, purslane, morningglory species, ragweed, and smartweed. Use in combination with methylated seed oil (1 gal. per 1000 gal. of spray solution) and ammonium sulfate at 8.5 to 17 lbs per 100 gal of spray solution. Do not apply more than 3 oz/A per year. TreeVix has a 0 day PHI. TreeVix may be tank mixed w/ glyphosate, Rely 200, or Poast.

APPLE NUTRIENT SPRAYS

David Lockwood, Univ. of Tennessee

Nitrogen

Within limits, fruit set has been shown to increase as the nitrogen content of fruit buds increases. Likewise, increasing the strength of fruit buds by raising their nitrogen levels will extend the period of time during which the ovules within the blossom are receptive to fertilization.

The nitrogen requirements of apple trees are usually satisfied through the use of ground applications in spring at or immediately after bloom. The strength of flower buds and their early season growth potential are largely determined by the nitrogen reserves in the bud when growth begins in spring. Nitrogen applied to the soil during dormancy has little effect on the current season's flower buds or fruit set. It will, however, affect vegetative and fruit growth later in the growing season and nitrogen content of fruit buds formed for the next season's crop.

Foliar sprays provide a means of immediately providing nitrogen to meet specific needs. In the spring following a heavy crop or in situations where otherwise healthy trees are low in nitrogen, or where a late cold spell may have damaged new spur leaves, foliar applications of a low biuret form of urea may be beneficial. An application of 6 to 12 lbs. of urea per acre at the early pink stage can stimulate development of spur leaves, lengthen the time during which blooms may be pollinated and fertilized and improve fruit set. A second application at petal fall to first cover may be beneficial for weakened trees, especially when development of foliage and fruit is delayed by cold weather.

Where leaf nitrogen levels are already high (above 2.2% for Golden and 2.4% for most other varieties), application of foliar urea sprays are unlikely to produce beneficial results and may, in fact, result in greater difficulty in thinning the crop. Foliar applications of nitrogen at the above rates later in the season prior to harvest may delay fruit maturity, hasten fruit softening, increase vegetative growth rates and increase problems with bitter pit.

Growth of young, non-bearing trees may be increased through foliar applications of low biuret urea at the rate of 4 lbs. per 100 gallons (6 to 12 lbs. per acre) in cover sprays through July. These sprays should only be considered as supplemental to soil nitrogen applications and good weed control.

A fall spray of urea at the rate of 4 to 5 lbs. per 100 gallons of water may be of value for all apple trees by speeding up decomposition of leaf litter and dropped fruit. This can significantly decrease pressure the following spring from diseases that overwinter on leaf litter and also enable application of rodenticides earlier in fall. The spray should be directed to trees and the orchard floor. Where substantial leaf loss due to disease has occurred and trees may be weakened, a urea application at this time may help to strengthen buds.

Boron

Internal corking is the most common fruit deficiency symptom of boron. Other symptoms may include small, flat, misshapen fruit, cracking and russetting, premature ripening, increased fruit drop and low seed count.

In situations where internal corking has not been a severe problem, a maintenance application of 1 lb. Solubor per 100 gallons of water at petal fall or first cover is suggested. If corking has been a problem, apply 1 lb. of Solubor per 100 gallons in both the petal fall and the first cover sprays.

Solubor is compatible with most pesticides used in cover sprays. Delay application of calcium chloride until after Solubor has been applied.

Calcium

The most common symptoms of calcium deficiency are cork spot and bitter pit. Low levels of calcium may also be implicated in senescent breakdown of fruit, early ripening and increased watercore.

Cork spot shows up as shallow depressions on the fruit surface with brown, firm, corky tissue under the skin and as corky areas deeper in the flesh of the apple. These corky areas develop by midseason. Early-season water stress, irregular cropping, excessive tree vigor and poor nutrition are all associated with the development of cork spot.

Bitter pit shows up as numerous, small sunken pits of collapsed tissue about 1/8 inch in diameter and extending into the flesh less than 1/16 inch. Bitter pit usually develops within 2 weeks either side of harvest. Symptoms show up first on the blossom end of the apple and progress toward the stem end as the magnitude of the deficiency increases.

Conditions contributing to the development of calcium deficiency include high tree vigor due to excess nitrogen fertilization or excessive pruning, low soil pH, large fruit size and a light crop. Certain varieties such as Mutsu (Crispin), Jonagold and Fuji tend to be more prone to bitter pit than most other varieties.

Controlling calcium deficiency may include one or more of the following:

1. maintaining soil pH at or about 6.5
2. applying gypsum to the soil under trees (rates may vary from 15 to 50 lbs. per tree)
3. using calcium nitrate to further increase the calcium content of the soil and to prevent lowering soil pH
4. avoiding excessive pruning and high rates of nitrogen fertilization
5. promoting annual cropping through proper pollination, crop thinning and irrigation
6. foliar application of calcium

Calcium chloride, calcium nitrate or numerous commercial formulations of calcium may be applied as foliar sprays. Calcium chloride and calcium nitrate have performed as well as or better than other calcium formulations and are less expensive.

If bitter pit has not been a severe problem, using calcium chloride in the last 2 to 3 cover sprays may be adequate. For more severe problems, consider applying calcium in all cover sprays. Do not apply calcium chloride in temperatures exceeding 85° F. Delete calcium chloride from a cover spray if sufficient rainfall has not occurred since the previous cover spray to wash the residue off leaves. Calcium chloride is corrosive, therefore, equipment should be thoroughly cleaned after each application. Apply calcium chloride at the rate of 2 to 4 lbs. per 100 gallons of water.

Calcium nitrate can be used instead of calcium chloride. However, the rate should be increased somewhat to provide an equivalent amount of nitrogen. Use 3 to 6 lbs. calcium nitrate per 100 gallons of water. Do not apply calcium nitrate within 2 to 3 weeks of harvest.

APPLE GROWTH REGULATORS

Consult the current version of the "Integrated Orchard Management Guide for Commercial Apples in the Southeast".

COMMERCIAL BLACKBERRY AND RASPBERRY WEED CONTROL

Wayne E. Mitchem, Extension Associate - Fruit Weed Control
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USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREPLANT			
bentazon (Basagran 4 SL)	1.5 to 2 pt	0.75 to 1	Apply at or before planting only. Add two pints of crop oil concentrate in 20 to 50 gallons of water per acre. DO NOT apply within 1 year of harvest. Sequential applications needed for yellow nutsedge control.
carfentrazone (Aim EC 2 EC) (Aim EW 1.9 EW)	0.8 to 1.5 fl oz	0.013 to 0.023	For annual broadleaf weeds including morningglory, pigweed, and spindewort. Apply prior to planting to weeds less than 4 inches in height or rosettes less than 3 inches across. Coverage is essential for weed control. Add a non-ionic surfactant at 1 qt per 100 gal of spray solution. May be tankmixed with glyphosate.
glyphosate Various trade names and formulations are available	See label	See label	Apply to emerged weeds before transplanting. Perennial weeds may require higher rates of glyphosate (i.e. 4 lb ai/A). Some formulations of glyphosate may require the addition of an adjuvant.
PREEMERGENCE ^{1,2,3}			
dichlobenil (Casoron 4 G) (Casoron CS)	100 lb 1.4 to 2.8 gal	4 2 to 4	Apply in early winter to plants that have been established one year or more. DO NOT apply during new shoot emergence. Use no later than mid-February. Casoron CS can be tank mixed with paraquat for POST weed control. Rainfall within 1 to 2 days after application allows for maximum herbicide performance.
norflurazon (Solicam 80 WDG)	2.5 to 5 lb	2 to 4	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 <u>12 months prior to use</u> . Application of Solicam may result in temporary bleaching or chlorosis of the leaves from which the plant will recover. 60 day preharvest interval.
oryzalin (Surflan 4 AS) (Oryzalin 4 AS)	2 to 6 qt	2 to 6	Controls annual grasses and small seeded annual broadleaf weeds. Use low rate for short-term control (2 to 4 months); high rate for long-term control (6 to 8 months). DO NOT apply to newly established plantings until the soil has settled and no cracks are present. Apply before annual weeds emerge or add Gramoxone or glyphosate for control of emerged weeds. Do not apply when fruit is present.
simazine (Princep), 90 WDG (Princep) 4L (Simazine) 4L	2.2 to 4.4 lb 2 to 4 qt	2 to 4	Controls annual broadleaf weeds and some annual grasses. Rate is soil texture dependent. Apply in spring or apply a split application of half rate in spring followed by half rate in fall. Do not apply after fruit set or illegal residues may result. On plantings less than 6 months old, use 1.0 lb AI/A. DO NOT use on gravelly, sand, or loamy sand soils. DO NOT apply when fruit is present. Apply in combination with oryzalin or Solicam for improved annual grass control.
oryzalin (Surflan 4 AS) (Oryzalin 4 AS) + simazine (Princep 4 L, 90 WDG)	2 to 4 qt + 2.2 lb 2.0 qt	2 to 4 + 2	Use for broad spectrum annual grass and broadleaf weed control. Especially useful on plantings less than 6 months old, use 1.0 lb AI/A of simazine. DO NOT apply when fruit is present. DO NOT use on gravelly, sand, or loamy sand soils.
tenbacil (Sinbar) 80 WP	0.5 to 2 lb	0.4 to 1.6	Use before fruit set in spring or after harvest either before weeds emerge or shortly after weeds emerge. Use only in plantings established one year or more. DO NOT spray foliage. DO NOT use on sandy soils with less than 3% organic matter. See replant restrictions.

COMMERCIAL BLACKBERRY AND RASPBERRY WEED CONTROL (continued)

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE			
carfentrazone (Aim EC) 2.0 EC (Aim EW) 1.9 EW	0.5 to 6.4 fl oz	0.008 to 0.1	Apply as a post-directed spray for primocane and weeds including morningglory, pigweed, and spiderwort. Aim at 1 to 2 fl oz provides control of most sensitive annuals. For primocanes, apply when 6 inches in height as a directed application of 6.4 fl oz per acre in a minimum of 20 gallons of spray at intervals of 14 to 21 days. Direct the spray at the bottom 18 inches of the canes and also to contact the soil out to 24 inches from each side of the plant row. Coverage is essential for weed control. Add a crop oil concentrate at 1 gallon per 100 gallon of spray mix.
glyphosate Various trade names and formulations are available	See label	See label	Use for broad spectrum control of emerged weeds, both annuals and perennials. Apply as a directed spray under bearing and non-bearing canes. DO NOT allow spray to contact foliage or green bark of canes. Brambles are especially sensitive from bloom until full dormancy. Refer to product label for rates to control specific weeds. Allow a minimum of 14 days between last application and harvest. May be tank mixed with certain preemergence herbicides to provide postemergence and residual weed control. The addition of an adjuvant to some glyphosate products is recommended, see labels.
paraquat (Gramoxone) 2 SL (Firestorm) 3 SL (Parazone) 3 SL (Paraquat Concentrate) 3 SL	1.3 to 4.0 pt 1.3 to 2.7 pt	0.25 to 1 0.48 to 1	Use for broad spectrum, contact control of emerged weeds. Apply as a high volume (50 gpa), coarse directed spray with 1qt surfactant/100 gal of spray solution. Avoid drift. Apply before emergence of new canes or shoots to minimize potential for plant injury. May be tank mixed with certain preemergence herbicides to provide postemergence and residual weed control. Contact with new growth will cause injury.
POSTEMERGENCE GRASS CONTROL			
clethodim (SelectMax 0.97 EC) (Intensity One)	12 to 16 fl oz	0.094 to 0.121	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 to 18 in. tall; bermudagrass-3 in. tall or with 4 to 8 in. runners; annual grasses-2 to 8 in. tall. Does not control nutsedge(s). Select Max has 7 day PHI for caneberry, unless otherwise noted on the label all other clethodim formations are for non-bearing caneberry.
fluazifop (Fusilade DX) 2 L	16 to 24 fl oz	0.25 to 0.38	Use for control of annual and perennial grasses under NON-BEARING plants (harvest not expected within 1 year). Sequential applications will be necessary for controlling perennial grass weeds. Low spray volumes (10 GPA) generally improve control. Add crop oil concentrate (1 qt/A). Make application to johnsongrass-12 to 18 in. tall; bermudagrass-3 in. tall or with 4 to 8 in. runners; annual grasses-2 to 8 in. tall. Does not control nutsedge(s).
sethoxydim (Poast) 1.5 EC	1 to 2.5 pt	0.18 to 0.47	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 in. tall; higher rates on larger annual grasses and perennial grasses. Does not control nutsedge(s). 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.

¹All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5 to 1.0 inch of water). If no rain event occurs and no supplemental overhead watering is provided after a preemergent herbicide application, weed control can be extremely poor.

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

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

COMMERCIAL BLUEBERRY WEED CONTROL

Mark A. Czarnota, Extension Horticulture-Weed Science

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREPLANT			
glyphosate Various trade names and formulations are available	See label	See label	Apply to emerged weeds before transplanting. Perennial weeds may require higher rates of glyphosate. Some formulations of glyphosate may require the addition of an adjuvant. DO NOT allow glyphosate to contact green stems or leaves of desirable vegetation.
PREEMERGENCE ^{1,2,3}			
dichlobenil (Casoron 4 G)	100 to 150 lb	4 to 6	Apply in early winter to plants that have been established one year or more. Use from mid-November to mid-February. Good product for controlling non-seed bearing plants (i.e. Bracken fern (<i>Pteridium aquilinum</i>)), winter annuals, and Florida betony (<i>Stachys floridana</i>). After application, Casoron must be watered in with ½ to 1 inch irrigation event.
diuron (Direx 4 L) (Karmex 80 DF) (Various generic formulations)	1.2 to 1.6 qt 1.5 to 2.0	1.2 to 1.6	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, or if small weeds are present then 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.
flumioxazin (Chateau 51 WDG)	6 to 12 oz/A	0.375 to 0.75	Excellent herbicide for preemergence weed control. Use 10 to 12 oz rate for extended control (3 plus months). Controls a wide array of annual broadleaf and grass weeds (some early postemergent activity).
hexazinone (Velpar 80 DF)	1.3 to 2.6 lb	1 to 2	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.
mesotrione (Callisto 4L)	3.0 to 6.0 oz	0.094 to 0.19	May be applied pre or post bloom, direct to the base of the plant. Apply either a single 6 oz application or two 3 oz split applications can be made. If split application, they must be 14 days apart. If early postemergence weeds 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 blueberry foliage.
napropamide (Devrinol 50 WDG) (Devrinol 10 G)	8 lb 40 lb	4.0 4.0	Use for control of annual grasses and small seeded broadleaf weeds. Rainfall or overhead irrigation is needed within 24 hours of application. 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.
norflurazon (Solicam 80 WDG)	2.5 to 5.0 lb	2.0 to 4.0	Provides excellent preemergence control of annual grasses and some broadleaf weeds. Can also provide suppression of some perennials. Apply as a directed spray in the fall or early spring when dormant--fall applications control a broader weed spectrum than spring applications. DO NOT apply to blueberry plants established less than 6 months. Use the low rate on coarse textured soils; higher rates on fine textured soils. Make only 1 application per year. DO NOT use on nursery stock. Temporary bleaching or chlorosis may occur. Do not apply within 60 days of harvest.
pronamide (Kerb 50 W)	2 to 4 lb	1 to 2	Apply as a single directed spray in established blueberries only for early postemergence control of susceptible winter annual weeds, perennial grasses, and chickweed and for preemergence control of these and other weeds. DO NOT APPLY ON NEW PLANTINGS UNTIL ESTABLISHED. Do not exceed 4.0 lb product per acre per Year. Apply in late fall or winter when soil temperature is 55° F or less.
simazine (Princep, Simazine) 90 DG (Princep, Simazine) 4 F and other generic formulations	2.2 to 4.4 lb 2 to 4 qt	2 to 4	Use for control of annual broadleaf weeds and some annual grasses. A tank mix partner will enhance spectrum of weed control (i.e. norflurazon, oryzalin). 2 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.
terbacil (Sinbar 80 WP)	0.5 to 3 lb	0.4 to 2.4	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 in. tall. DO NOT use on sand, loamy sand, or gravelly soils with less than 3% organic matter. DO NOT use on any soils with less than 1% organic matter. Apply to the ground beneath the bushes, avoiding contact of foliage and fruit.

COMMERCIAL BLUEBERRY WEED CONTROL (continued)

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE HERBICIDES FOR CONTAINER PRODUCTION (BLUEBERRIES GROWN FOR PLANTS^{1,3})			
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, Jul, Sep, and Nov). Plants should be well rooted at the time of first herbicide application.			
benefin / oryzalin (XL 2G)	150 lb	3	USE ON NON-BEARING PLANTS ONLY. No postemergent activity. Excellent product for containers and small in ground operations. Controls a wide array of annual broadleaf and grass weeds.
dithiopyr (Dimension 1SL) (Dimension 40 WP)	2.0 qt/A 20 oz/A	0.5 0.5	USE ON NON-BEARING PLANTS ONLY. Provides preemergent control of most annual grasses and small seed broadleaf weeds. Also provides early postemergent control of some annual grasses up to 3 tillers. Use on one year old plants.
flumioxazin (Broadstar 0.25 GR) (Chateau 51 WDG)	150 lb/A 6 to 12 oz/A	0.375 0.375 to 0.75	Excellent product preemergence weed control. Use 10 to 12 oz rate for extended control (3 plus months). BroadStar is excellent for containers and small in ground operations. Controls a wide array of annual broadleaf and grass weeds (some early postemergent activity).
isoxben (Gallery 75 DF)	0.66 to 1.33 lb/A	0.5 to 1.0	USE ON NON-BEARING PLANTS ONLY. Provides excellent pre-emergent weed control of many small seeded broadleaf weeds. Maximum of four pounds per year. Needs a tank mix partner for annual grass control (i.e. Oryzalin)
isoxaben + trifluralin + oxyfluorfen (Showcase 2.5 TG)	100 - 200 lb	0.25 - 0.5 + 2.0 - 4.0 + 0.25 - 0.5	USE ON NON-BEARING PLANTS ONLY. Excellent product for containers and small in ground operations. Controls a wide range of annual weeds. DO NOT apply to newly planted blueberries until the soil has firmly settled and no cracks are present. DO NOT apply to blueberries when foliage is wet. Apply ½ to 1 inch of irrigation water to Showcase treated area if adequate rainfall is not received within 3 days of application. Repeat applications of 150 lbs or higher should not be made sooner than 60 days. DO NOT apply more than 600 lbs of Showcase per year.
oxadiazon (Regalstar 2G)	100 to 200 lb/A	2 to 4	USE ON NON-BEARING PLANTS ONLY. Provides good preemergent weed control on a large spectrum of grass and broadleaf weeds. Works well on many winter annuals (i.e. Bittercress, Oxalis, etc.). Excellent product for containers and small in ground operations. Label recommends using on small acreage to confirm safety before large scale use.
trifluralin / isoxaben (Snapshot 2.5 TG)	150 to 200 lb	3.75 to 5.0	USE ON NON-BEARING PLANTS ONLY. No postemergent activity. Excellent product for containers and small in ground operations. Control a wide array of annual broadleaf and grass weeds.
POSTEMERGENCE HERBICIDES²			
glufosinate (Rely 1L)	3 to 5 qt (1.5 to 4.0 oz /gal)	0.75 to 1.25	Good on annual and perennial weeds with shallow root systems. Provides only suppression of perennial type weeds such as yellow and purple nutsedge. Apply 5 quarts per acre when weeds are greater than 6 inches. Do not allow spray drift to contact desirable foliage or uncallused bark of young branches as damage will occur. Do not apply more than 12 quarts of Rely per acre in a twelve month period. Do not apply within 14 days of harvest or through any type of irrigation system
glyphosate Various trade names and formulations are available	see label	see label	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 preemergence herbicides to provide postemergence and residual weed control. Blueberry growing in bark beds or other soil-less media are susceptible to glyphosate injury.

COMMERCIAL BLUEBERRY WEED CONTROL (continued)

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE HERBICIDES² (cont.)			
halosulfuron (Sanda 75DF)	0.5 to 1 oz	0.375 to 0.75	Apply as a postemergence application to control yellow and purple nutsedge, as well as many other types of sedge. Can be applied with a backpack sprayer at 0.9 g/1 gal of H ₂ O, as this is useful when nutsedge is in patches. Apply when nutsedge is at least 4 to 6 inches tall. Does provide preemergence control of nutsedge (and other weeds), and should be used as a pre application if a severe infestation is expected. In South Georgia, a March or April pre application should be targeted to coincide with sedge emergence (apply after another pre herbicide, i.e Chateau). Apply post application with a non-ionic surfactant (1/3 oz per gallon or 1 qt / 100 gallon of water). DO NOT allow the spray to contact foliage of blueberry plant, and DO NOT apply if plants are in the ground less than 1 year old (plant should be 12 to 18 inches and healthy). If incidental spray contact occurs to blueberry plant (green bark, exposed roots, or drift), some plant damage may occur and manifest as bud blasting and leaf yellowing (especially at growing point). Plants should recover in 2 to 4 weeks of active growth. Wait at least 45 days between applications. Post-harvest interval (PHI) is 14 days.
POSTEMERGENCE (GRASS HERBICIDES)²			
clethodim (SelectMax 0.97 EC)	9 to 16 fl oz	0.068 to 0.121	Controls annual and perennial grasses in blueberries. Use higher rates and sequential applications for perennial grasses. Add non-ionic surfactant (1 qt/A). Make application to johnsongrass-12 to 18 in. tall; bermudagrass-3 in. tall or with 4 to 8 in. runners; annual grasses-2 to 8 in. tall. Multiple applications will be required for difficult grasses. Does not control nutsedge(s). Can us up to 7 days of harvest (PHI 7 days). Maximum single application is 16 oz/A, and yearly maximum is 64 oz/A.
fluazifop (Fusilade DX 2 L)	16 to 24 fl oz	0.25 to 0.38	Controls annual and perennial grasses in NON-BEARING PLANTINGS (harvest not expected within 1 year). Sequential applications will be necessary for perennial grass control. Low spray volumes (10 GPA) generally improve control. Add crop oil concentrate (1 qt/acre). Make application to johnsongrass-12 to 18 in. tall; bermudagrass-3 in. tall or with 4 to 8 in. runners; annual grasses-2 to 8 in. tall. Does not control nutsedge(s).
sethoxydim (Poast 1.5 EC)	1.5 to 2.5 pt	0.18 to 0.47	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/acre). For annual grasses up to six inches tall, 1 to 1.5 pt/acre should be adequate. For annual grasses taller than six inches and perennial grasses, use up to 2.5 pt/acre. Do not use more than 5 pt/acre per season and the last application must be made at least 30 days prior to harvest. Does not control nutsedge(s). If spot spraying use a 1 to 1.5% solution.

¹All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5 to 1.0 inch of water). If no rain event occurs and no supplemental overhead watering is provided after a preemergent herbicide application, weed control can be extremely poor.

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

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

OVERVIEW OF BLUEBERRY GROWTH REGULATORS

(Read detailed information before purchase or use)

Gerard Krewer and Scott NeSmith, Horticulturists

Problem	Management Options	Amount of Formulation Per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments
Poor Spring leaf development and delayed flowering of some southern highbush and rabbiteyes, delayed harvest	Dormex or Bud Pro (50% hydrogen cyanamide)	Typically 1 ½% Dormex or Bud Pro plus 1 pint per acre of non-ionic surfactant in 50 gallons of water	++++ certain cultivars	72 hours	NA	This is a material that must be used with caution. Enclosed cab tract or required for application. Will kill flower buds if applied after bud swell. Application must be based on bud development. Typical application dates for southern highbush in south Georgia are late Dec. or early Jan. Rabbiteyes applications are usually in late Jan. or early Feb. Use only on a small scale until you gain experience with the material. No not apply within 14 days of oil application or 30 days of copper fungicide application.
Poor fruit set of rabbiteye blueberries in poor pollination situations or years; Poor fruit set following partial freeze damage of rabbiteye flowers	Gibberellic acid - ProGibb 4% liquid concentrate or GibGro 4 LS or Gibbex 4%	24-32 oz./acre (4% gibberellic acid) or 24-32 grams gibberellic acid/acre applied twice. Total of 48-64 oz./acre in most cases	++++	12 hours	40 days	First application: When at least 40-50% of the blooms are open. About 10% of the flower petals should have fallen. Second application: 10-18 days later. 1. min . of 40 gal. water/acre. 2. Add surfactant. 3. If solution is alkaline (pH greater than 8.0), lower the pH with a buffering agent. 4. Apply at night or during slow drying conditions
Cultivars blooming too early and suffering freeze damage, two cultivars not blooming at the same time for cross pollination	Super Boll, 55.4% ethephon	400 ppm solution; 9.2 ounces per 100 gallons plus 1 pint per acre of non-ionic surfactant	++++ some cultivars such as Climax	48 hours	NA	For use only in Georgia. Test on a limited basis before wide spread use. May delay harvest. Applied in the Fall for bloom delay the next Spring to help avoid Spring freeze damage. Can also be used on an early blooming cultivar to help synchronize its bloom with a later blooming cultivar (i.e. Climax treated in a Climax / Tifblue field will help improve bloom overlap.) First application in S. Ga.: mid October. Second application: early November Good coverage is necessary, apply 50-100 gallons per acre.

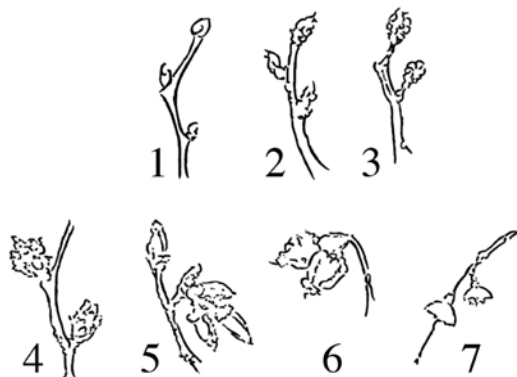
DORMEX TO ENHANCE FRUIT RIPENING OF CERTAIN SOUTHERN Highbush AND Rabbiteye Blueberries

Response	Material	Timing	Rate of Material	Additional Remarks
<p>If properly used, Dormex can stimulate more rapid leaf development in the spring, resulting in more concentrated ripening on the first two harvests on blueberry cultivars with poor spring leaf development in south Georgia. Both increased number of leaf bud breaks, and earlier leaf emergence occurs on poor leafing blueberry cultivars in response to Dormex or Bud Pro. Flower buds at stage 3 of bud development or beyond (see gibberellic acid bud stage section) are extremely vulnerable to chemical burn and/or injury when using Dormex or Bud Pro.</p>	<p>Dormex or Bud Pro -50% hydrogen cyanamide</p>	<p>Timing of Dormex or Bud Pro applications is extremely important in order to achieve the desired response and to avoid flower bud injury. Apply during the dormant season after significant winter chilling has been received, but before significant flower bud swelling occurs. Apply before a significant number of flower buds reach stage 3 (see flower bud chart in gibberellic acid recommendations). Timing must be based on flower development, however, generally optimum time of application in lower south Georgia has been early January on low chilling requirement southern high bush. Generally, the best timing for rabbiteyes such as 'Climax' has been late January or early February. But again, plants must be examined for their stage of development. If excess floral bud swell and floral bud break has occurred, chemical injury to buds is highly possible.</p>	<p>Typically 1.5-2% Dormex or Bud Pro with 0.25% non-ionic surfactant in a minimum of 50 gallons of water per acre. The 1.5% rate is three quarts of Dormex or Bud Pro plus one pint of surfactant in 50 gallons of water. The 2% rate is one gallon of Dormex or Bud Pro plus one pint of surfactant in 50 gallons of water. Most growers use 1 ½%. On some cultivars with very tight flower buds and where more complete defoliation of old leaves is desired, 2% can be used. Read the label carefully before use.</p>	<p>Dormex or Bud Pro is a moderately toxic material and is registered for application only with closed cab tractors. Read the label carefully before use.</p> <p>Do not consume alcohol the day before or after application. This makes your body more sensitive to the Dormex or Bud Pro reaction (cyanamide "flush"-rapid heat beat and skin reddening). Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 72 hours.</p> <p>Dormex or Bud Pro is highly corrosive to equipment. Clean up thoroughly after application.</p> <p>Avoid drift. Dormex or Bud Pro may be toxic to green plants such as winter vegetable crops, shrubs, also pets, livestock, etc. Use a spray pressure of 50 psi to reduce drift.</p> <p>Flower buds sprayed at stage three or beyond may be killed by Dormex or Bud Pro, especially at concentrations of 1.5% to 2%. However, when applied at the correct window (stage 1 and 2), 1.5% to 2% usually gives a much better response than 1%.</p> <p>Direct spray nozzles to the area with flower buds.</p> <p>Do not apply within 14 days of an oil spray or 30 days of copper fungicide apply during dry weather. Slow drying may enhance Dormex or Bud Pro activity and cause more phytotoxicity if the buds are swelling.</p> <p>Apply during dry weather. Slow drying may enhance Dormex or Bud Pro activity and cause more phytotoxicity if the buds are swelling.</p> <p>Dormex or Bud Pro may advance flowering by several days, slightly increasing the risk of freeze damage.</p> <p>Dormex or Bud Pro is not needed on cultivars with good leaf development such as 'Sharpblue', 'Emerald', 'Brightwell', etc. Dormex or Bud Pro response has been erratic on 'O'neal'.</p> <p>Do not apply to cultivars with "puffy" flower buds such as 'Sharpblue'. Dormex or Bud Pro may wick between the bud scales and kill even dormant flower buds.</p> <p>'Primadonna', 'Jewel' and 'Windsor' may be sensitive to Dormex or Bud Pro.</p>

GIBBERELIC ACID AS AN AID FOR FRUIT SET OF RABBITEYE BLUEBERRIES

Additional Considerations and Precautions for Using Gibberellic Acid

- Gibberellic acid is expensive, but has been effective in increasing fruit set due to poor pollination. Poor pollination can be the result of cultivars not blooming together, cultivars which have low pollen compatibility, low bee activity, high night temperatures during bloom, low temperatures during bloom, excessively rainy weather during bloom, and damage to the blooms from insects such as thrips. Many large fields in south Georgia will benefit from gibberellic acid application in most years.
- Good results can be obtained with two applications of 24-32 oz./acre (48-64 oz./acre total) in 40 gallons of water per acre, spraying both sides of the bush each time. Another successful method is cultivar directed treatment (CDT). Where two varieties with different bloom dates are planted together (i.e. 'Climax' + 'Tifblue') this is the best method. Using CDT, the first and second application of gibberellic acid are directed toward the first variety to bloom (i.e. 'Austin' or 'Climax'). Some gibberellic acid will also reach the adjacent variety (i.e. 'Tifblue'), helping the early flowers to set. The third and fourth sprays are directed toward the later blooming variety (i.e. 'Tifblue'). The last 'Austin' or 'Climax' flowers to open will benefit from spray drift from the 'Tifblues'. The total applied during the season is normally 48-64 oz. acre.
- Apply gibberellic acid in about 40 gals. of water per acre. Since gibberellic acid activity is concentration dependant (150 p.p.m. or greater active ingredient is best) at least 0.6 oz. of ProGibb should be used per gallon of finished spray (i.e. 24 oz. in 40 gal., 30 oz. in 50 gal., or 3 6 oz. in 60 gal.).
- Although common non-ionic surfactants can be used, it is recommended that X-77, Silwet L-77, Kinetic, or Flood be used with gibberellic acid. Follow label rates carefully. Silwet L-77 is used at the rate of only 3.2 oz./100 gal. of spray. Caution should be used in trying other surfactants, because they could burn blueberry blooms.
- In past years, only night applications of gibberellic acid were recommended. However, several experiments in 1995 showed comparable fruit set occurred for both early day and night applications. In any case, it is best to apply gibberellic acid during periods of slow drying such as at night, in the late evening or very early in the morning.
- Gibberellic acid should be compatible with most fungicides, but a small-scale trial is recommended to make sure settling or clabbering is not a problem. The spray solution pH should be checked to make sure the pH is not too alkaline (pH 8.0 or above). If the pH is 8.0 or above, add a buffering agent.
- Do not apply within 40 days of harvest.
- If possible, do not apply if rain is forecast within 12 hours.
- Do not apply to bushes in a low state of vigor.
- Excessive applications may reduce flowering the following year by setting more fruit than the bush can properly mature. This is especially true if the bushes are in a low state of vigor. To not apply to young bushes (i.e. 3 years old or less) since heavy fruiting may delay establishment.
- Some cultivars such as 'Alapaha', 'Brightwell' and 'Powderblue' usually set a good crop if planted with compatible cultivars for cross pollination. They seldom need applications of gibberellic acid unless bee activity is low or the blooms are damaged by spring freezes. 'Premier' and 'Tifblue' respond well to gibberellic acid.
- Southern highbush blueberries often set more fruit than they can properly mature. Gibberellic acid can increase this problem.
- Part of the yield increase often seen with gibberellic acid is from smaller size, seedless or nearly seedless berries which ripen later in the season. If you are mechanically harvesting for the frozen market, this is not a problem, but it could pose a problem for hand picking of fresh fruit.
- Blueberry fruit set and fruit size under natural conditions is determined in large part by number of seeds in the fruit. Low seed counts result in smaller, later ripening fruit. Gibberellic acid can set fruit, but will not fully substitute for total lack of seeds. Fruit set with a combination of gibberellic acid and some seeds develop better fruit size, so bee pollination is important even in fields treated with gibberellic acid. Growers should use honey bees (min. 2 strong hives per acre) if there are not large numbers of honeybees and wild bees such as bumble bees and southeastern blueberry bees present in the blueberry field. Most large fields do not have enough bees, so honeybees should be imported.
- Although, flowers are most receptive to fruit set with gibberellic acid at stage 5 (elongated but not yet open) and 6 (open), seedless fruit set just with gibberellic acid are smaller in size than partially seeded fruit set with the help of gibberellic acid. Allow at least 40 to 50% of the flowers to open and be worked by bees before gibberellic acid application. About 10% of the petals (corollas) should have fallen. Apply a second application of gibberellic acid 10 to 18 days later.



- 1 = no visible swelling, bud scales completely enclose the flowers;
- 2 = visible swelling of bud, scales separating, flowers still completely enclosed;
- 3 = bud scales separated, apices of flowers visible;
- 4 = individual flowers distinguishable, bud scales abscised;
- 5 = individual flowers distinctly separated, corollas elongated but closed;
- 6 = corollas completely expanded and open;
- 7 = corollas dropped.

Adapted from J. M. Spiers, 1978, J. Amer. Soc. Hort. Sci. 103 (4): 452-454.

Fig. 1. Stages of flower bud development in rabbiteye blueberries

Gibberelic Acid as an Aid for Fruit Set of Rabbiteye Blueberries Following Slight Freeze Injury

Response: Increase fruit set of flowers with slight freeze damage.

Material: Gibberellic acid-ProGibb 4% liquid concentrate or GibGro 4 LS

Situations and timing: The use of gibberellic acid for fruit set following freeze damage to rabbiteye blueberries can be beneficial. Field and laboratory experiments indicate it may be used in several situations. **Actual damage suffered during a freeze depends on many factors including stage of bloom, cultivar, wind, low temperature, and duration of low temperature. Blossom temperatures during radiation freezes can be 2-3F lower than protected thermometer temperatures.**

As a general rule, blossom temperatures in the range of 26-32/F will cause partial flower damage to rabbiteye flowers at stage 5 and 6. If the freeze occurs during full bloom, this calls for the first gibberellic acid application soon after the freeze event. Apply a second application of gibberellic acid 10 to 18 days later.

Temperatures below 26F are likely to cause total death of flowers at stage 5 and 6. In this case, application of gibberellic acid starts when the slightly freeze damaged stage 3 and 4 flowers develop into stage 5 and 6. Note that freeze damaged flowers may never open properly or be receptive to bee pollination, so an application of gibberellic acid should be applied when a large percentage of the damaged blooms reach stage 5 and a stage equivalent to 6 in age. If the weather is warm after a freeze this is often about one week after the freeze. Apply a second application of gibberellic acid 10 to 18 days later.

Ethephon for Bloom Delay on ‘Climax’ and Certain other Blueberry Cultivars in Georgia

Response	Material	Timing	Rate of Material	Additional Remarks
Spring bloom delay if applied the previous Fall. Length of delay will vary with cultivar, number of applications and rate of ethephon applied. Delays of seven to 14 days are likely to occur with ‘Climax’, with seven to ten days being typical. Response has been variable on some sites. Trial on a small scale on your farm with your cultivars before widespread use.	ethephon: Superboll (55.4% a.i.)	First application: mid- October Second application: early November If possible, apply when temperatures are in the range of 60 to 80 degrees F. One application will provide most of the bloom delay, a second application will lengthen the bloom delay.	Use 4.6 ounces per 50 gallons or 9.2 ounces per 100 gallon of finished spray solution. This will produce a 400 ppm solution of ethephon. Add a non-ionic surfactant at the rate of one pint per acre. Good coverage is needed for this material to work. Apply a minimum of 50 to 100 gallons of water per acre depending on bush size.	Fruit ripening will be delayed. Length of delay of fruit ripening is related to improved crop load and delayed flowering. Ethephon has been tested for a number of years on a number of cultivars of blueberries. No plant damage or flower bud damage has been observed, but growers are cautioned to mix the material at the proper rate. Only healthy plants should be sprayed. In several trials, flower bud numbers have been increased. If a cultivar sets excessive flower buds already, use only a trial basis. Cultivars which have demonstrated appreciable bloom delay with ethephon are: ‘Climax’, FL86-19(“V1”), ‘O’Neal’, ‘Sharpblue’, and ‘Woodard’. Cultivars which have exhibited minimal bloom delay with ethephon are: ‘Bluebelle’ and ‘Tifblue’ (zero to two days delay in bloom). To improve bloom synchronization of ‘Climax’ planted with ‘Tifblue’ or ‘Brightwell’, spray only the ‘Climax’. In a trial with an airblast sprayer, drift of ethephon spray from the treated rows of ‘Climax’ had minimal effect on bloom of ‘Brightwell’ where a good stand (solid row) of ‘Climax’ was present. Adjust spray nozzles so primarily ‘Climax’ is sprayed.

COMMERCIAL GRAPE (MUSCADINE AND BUNCH) WEED CONTROL

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

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE			
oryzalin (Surflan) 4AS 4.0 lb/gal (oryzalin) 4.0 lb/gal	2.0 to 6.0 qt	2.0 to 6.0	Use for control of annual grasses and small seeded annual broadleaf weeds. Use low rate for short-term control (2 to 4 months); high rate for long-term control (6 to 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 paraquat, Rely or glyphosate for control of emerged weeds. Sequential applications may be used so long as total use rate does not exceed 12 qt/A per year. Allow 2.5 months between applications.
flumioxazin (Chateau) 51WDG	6 to 12 ozs.	0.19 to 0.38	Grapes established <2 years must be trellised and are 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. Grapes grown for fruit consumption (table grapes, muscadines for fresh market) can only be treated with Chateau after final harvest until bud break. Once vines (wine/juice grapes only) break dormancy it is recommended that Chateau not be applied with glyphosate. This pertains only to grapes being grown for wine or juice. DO NOT apply within 60 days of harvest. Research indicates Chateau applied at 6 to 8 ozs./A in the spring followed by another 6 to 8 ozs./A in early summer is very effective. DO NOT use more than 6 ozs./A per application to soils having >80% sand and/or gravel content when vines are less than 3 years old.
simazine (Princep, Simazine) 90DF (Princep, Simazine) 4L	2.2 to 4.4 lb 2.0 to 4.0 qt	2.0 to 4.0	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 paraquat, Rely or glyphosate for control of emerged weeds. Tank mixing with oryzalin or Prowl H ₂ O will improve PRE control of annual grass weeds.
diuron (Karmex, Diuron) 80DF	2.0 to 3.0 lb	1.5 to 2.0	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 inch of overhead irrigation water follows treatment. This risk is assumed by user. May be tank mixed with Surflan or Solicam for broad spectrum annual grass and broadleaf weed control.
norflurazon (Solicam) 80DF	1.25 to 5.0 lb	1.0 to 4.0	Use for control of annual grasses, broadleaf weeds, and suppression of some perennials <u>only</u> under plants established in the vineyard at least 2 years. Apply in the fall or early spring prior to weed emergence--fall applications control a broader weed spectrum than spring applications. Use the low rate on sandy loam soils; higher rates on fine textured soils. DO NOT apply after bud break on sandy loam or coarser soils. Add paraquat, Rely or glyphosate for control of emerged weeds. Do not apply within 60 days of harvest. Loss of pigment in leaf veins will occur in coarse textured soils when applied within 3 months after bud break.
oxyfluorfen (Goal) 2XL (Galigan) 2E (Oxiflo) 2EC 2.0 lb/gal (Goal Tender) 3EC 4 lb/gal.	2.0 to 8.0 qt 1 to 4 pts	0.5 to 2.0	Apply ONLY to DORMANT plants that have vines on a trellis wire a minimum of 3 feet 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 preemergence or postemergence treatment. Use the higher rates for preemergence applications. May be tank mixed with simazine, Devrinol, Surflan, paraquat, or glyphosate. Refer to Goal label for information on rates for postemergence treatments and tank mixes.
pendimethalin (Prowl H ₂ O) 4 lb/gal	2 to 6 qt	2.0 to 6.0	Use for control of annual grasses and small seeded broadleaf weeds. DO NOT apply to newly planted vines until the soil has settled and no cracks are present. Apply to dormant vines (new transplants and one year old vines). DO NOT apply to newly planted vineyards if buds have started to swell. Apply before annual weeds emerge in the spring. Rainfall or irrigation (at least 0.5 in.) within 7 days of application is necessary for effective weed control. In bearing vineyards Prowl may be applied anytime after harvest, through winter, and in the spring. Use rate cannot exceed 6 qt./A per year. Prowl H ₂ O has a 90 day PHI.

COMMERCIAL GRAPE (MUSCADINE AND BUNCH) WEED CONTROL (continued)

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE (cont.)			
oryzalin (Surflan) 4AS 4.0 lb/gal (oryzalin) 4.0 lb/gal + simazine (Princep, Simazine) 90DF (Pincep, Simazine) 4L	2.0 to 4.0 qt + 2.2 to 4.4 lb 2.0 to 4.0 qt	2.0 to 4.0 2.0 to 4.0	Use for broadspectrum preemergence 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 paraquat, Rely or glyphosate for control of emerged weeds.
rimsulfuron (Matrix) 25WG (Pruvin) 25WG (Solida) 25WG	4.0 ozs.	0.063	Rimsulfuron has PRE and POST activity on broadleaf and some grass weeds. For broad spectrum residual control Matrix should be tank mixed with oryzalin or duiron. It should be tank mixed with glyphosate, paraquat, or Rely 280 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. Rimsulfuron may be applied as sequential applications so long as total use rate does not exceed 4 ozs /A per year and application is made in band that is <50% of the vineyard floor.
POSTEMERGENCE			
paraquat (Firestorm) (Paraquat Concentrate) (Parazone) 3.0 lb/gal (Gramoxone SL) 2 lb/gal	1.75 to 2.7 pts 2 to 4 pts.	0.6 to 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 to 6 in. tall. DO NOT allow spray drift to contact foliage or green cane tissue, since severe damage may occur. May be tank mixed with certain preemergence herbicides for postemergence and residual weed control.
glufosinate (Rely 280) 2.34 lb/gal	48 to 82 ozs.	0.88 to 1.5	Use for broad-spectrum control of emerged weeds and grasses, both annual 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 preemergence herbicides for postemergence and residual weed control. Does not have soil residual activity. Do not make more than 3 applications per year. Rely may be used for sucker control. See supplemental label for details.
glyphosate Various brands and formulations	See label for rate	0.75 to 2.0	Use for broad spectrum control of emerged weeds, both annuals and perennials. Apply as a directed spray, contact 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 in. 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 glyphosate in spray volumes of 25 gal/A or less is recommended for optimum results. Generic glyphosate formulations may require surfactant. Tank mix with residual herbicides for postemergence and preemergence weed control. Reduced rates may be used to suppress the growth of perennial grass sod between rows. See label for details.
clethodim (Select) 2.0 lb/gal (Intensity) (Select Max) 1 lb/gal (Intensity One) 1 lb/gal	6 to 8 oz. 12 to 16 oz.	0.095 to 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% active ingredient at 1 qt/100 gal of spray solution (0.25% v/v) is required for optimum results. Make application to johnsongrass-12 to 18 in. tall; bermudagrass-3 in. tall or with 4 to 8 runners; annual grasses - 2 to 8 in. tall. Does not control nutsedge(s). Sequential applications may be necessary to control perennial grass weeds.

COMMERCIAL GRAPE (MUSCADINE AND BUNCH) WEED CONTROL (continued)

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE (cont.)			
fluazifop (Fusilade DX) 2.0 lb/gal	1.0 to 1.5 pt	0.25 to 0.375	Use for control of annual and perennial grasses under <u>NON-BEARING</u> vines (harvest not expected within 1 year). Low spray volumes generally improve control. Add crop oil concentrate (1 qt/acre). Make application to johnsongrass-12 to 18 in. tall; bermudagrass -3 in. tall or with 4 to 8 in. runners; annual grasses-2 to 8 in. tall. Does not control nutsedge(s). Sequential applications may be necessary to control perennial grass weeds.
sethoxydim (Poast) 1.5 lb/gal	1.0 to 1.5 pt	0.23 to 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/acre). 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 in. 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(s).
carfentrazone (Aim) 2EC 2 lb/gal	1 to 2 oz.	0.016 to 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 PEACH WEED CONTROL

Wayne E. Mitchem, Extension Associate - Fruit Weed Control

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE			
oryzalin (Surflan) 4AS 4.0 lb/gal (oryzalin) 4.0 lb/gal	2.0 to 6.0 qt	2.0 to 6.0	Use on non-bearing and bearing trees for control of annual grasses and small seeded broadleaf weeds. Use low rate for short-term control (2 to 4 months). DO NOT apply to newly transplanted trees until soil has settled and no cracks are present. Apply before annual weeds emerge in the spring or add paraquat for control of emerged weeds. Tank mix with simazine for broadspectrum preemergence broadleaf weed control. Sequential applications may be used so long as total use rate does not exceed 12 qt/A per year.
pendimethalin (Prowl H ₂ O) 4.0 lb/gal	2 to 4 qt	2.0 to 4.0	Use for control of annual grasses and small seeded broadleaf weeds. DO NOT apply to newly planted trees until the soil has settled and no cracks are present. Apply before annual weeds emerge in the spring. Adequate rainfall or irrigation within 7 days of application is necessary for effective weed control. Apply in combination with paraquat for control of emerged weeds. Prowl has a 60 day PHI. Sequential applications may be used so long as total use rate does not exceed 4 qt./A. Allow at least 30 days between applications.
diuron (Karmex, Diuron) 80WDG Karmex XP) 80WDG (Direx, Diuron) 4L	2 to 2.75 lb 1.6 to 2.2 qt	1.6 to 2.2	Use for control of annual broadleaf weeds ONLY under trees established in the orchard for at least 3 years. Both a spring and fall treatment may be applied (2.0 lb /application). DO NOT use on sand, loamy sand, gravelly soils, or exposed subsoils. Do not use on soils with less than 1% organic matter. Apply in combination with paraquat for control of emerged weeds. See details on label for split applications. Karmax and Direx have 20 day PHI.
Indaziflam (Alion) 1.67 SC	5 to 6.5 oz	0.065 to 0.085	Use in orchards established 3 yrs. of longer. Low rate should be used on medium or coarse textured soils. Allow at least 30 days between applications. Trees in soil with cracks or channels, or depressions should not be treated. Do not apply more than 10.3 oz/A per year. Tank mix Alion with glyphosate, Rely. or paraquat for non-selection POST weed control. Alion has a 14 day PHI.
simazine (Princep, Simazine) 4L (Princep, Simazine) 90 DG	2.0 to 4.0 qt 1.75 to 4.4 lb	1.6 to 4.0	Use for control of annual broadleaf weeds ONLY under trees established in the orchard for at least 1 year. Apply only once per year--fall applications control a broader spectrum than spring applications. Use the low rate on coarse textured soils. Some chlorosis may be observed in areas where little or no topsoil is present. DO NOT apply to gravelly, sandy, or loamy sand soils. Add paraquat for control of emerged weeds.
oryzalin (Surflan) 4AS 4.0 lb/gal (oryzalin) 4.0 lb/gal + simazine (Princep, Simazine) 4L (Princep, Simazine) 90 DG	2.0 to 4.0 qt + 2.0 to 4.0 qt 1.75 to 4.0 lb	2.0 to 4.0 + 2.0 to 4.0 1.6 to 4.0	Use for broad spectrum annual grass and broadleaf weed control under trees established in the orchard for at least 1 year. Apply in spring before annual weeds emerge. DO NOT apply to gravelly, sandy, or loamy sand soils. Add paraquat for control of emerged weeds.
terbacil (Sinbar) 80WP or 80WDG	0.5 to 1.0 lb	0.4 to 0.8	NEWLY PLANTED AND NONBEARING ONLY: Apply once soil has settled after transplanting. Apply no more than 1 lb/A per year. For best results apply 0.5 lb in spring followed by another 0.5 lb when control from initial application fails. DO NOT apply to soils coarser than sandy loam having < 2% organic matter.
norflurazon (Solicam) 80 DF + diuron (Karmex, Diuron) 80 DF	2.5 to 5.0 lb + 2.0 to 3.0 lb	2.0 to 4.0 + 1.6 to 2.4	Do not use on trees established less than 3 years. Do not use on soils containing less than 1% organic matter or on gravelly sand or loamy sand soils. Apply in combination with paraquat for control of emerged weeds.

COMMERCIAL PEACH WEED CONTROL (continued)

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE (cont.)			
rimsulfuron (Matrix FNV) 25WG (Solida) 25WG (Pruvin) 25WG	4 oz.	0.063	For broad spectrum PRE control tank mix diuron, Sinbar, or Solicam with oryzalin or Prowl H20. Matrix FNV may be applied using sequential applications so long as total use rate does not exceed 4 oz./A. For non-selective POST weed control rimsulfuron may be tank mixed with glyphosate or paraquat. Do not treat orchards established less than 1 year. Rimsulfuron has a 14 day PHI for stone fruit and sequential applications can be made so long as total use rate does not exceed 4 oz/A per year and application is made in a band on <50% of orchard floor. Allow at least 30 days between applications.
norflurazon (Solicam) 80DF + simazine (Princep, simazine) 90 DG (Princep, simazine) 4L	2.5 to 5.0 lb. + 1.75 to 4.0 lb. 2.0 to 4.0 qt.	2.0 to 4.0 1.6 to 4.0 2.0 to 4.0	Use for broad spectrum preemergence broadleaf weed control. DO NOT use on trees established in the orchard less than 1 year. DO NOT apply to sand, loamy sand, or gravelly soils. Apply in combination with paraquat for control of emerged weeds.
diuron (Karmex, Diuron) 80DF or 80WDG + terbacil (Sinbar) 80WP or 80WDG	1.0 to 2.0 lb + 1.0 lb to 2.0 lb	0.8 to 1.6 + 0.8	Use for broad spectrum weed control <u>only</u> under trees established in the orchard for at least 2 years. Apply in spring or after harvest in the fall before weeds emerge or after weeds emerge but are less than 2 ins. tall. Research has shown this combination provides a longer period of weed control and controls a broader weed spectrum than either component herbicide used alone. DO NOT use on sandy, loamy sand, or gravelly soils or on eroded areas where subsoil or tree roots are exposed. DO NOT use on any soil with less than 1% organic matter.
flumioxazin (Chateau) 51 WDG	6 to 12 ozs.	0.19 to 0.38	DO NOT use more than 6 ozs./A per application on soils having >80% sand and/or gravel content. Trees planted less than 1 year must be protected with non-porous wrap, or a waxed container. DO NOT apply a second application within 30 days of initial application. In nonbearing orchards, after bud break tank mix with only paraquat. Chateau has a 60 day PHI. Chateau may only be used in bearing peach orchards after completion of final harvest until prior to bloom.
norflurazon (Solicam) 80DF	2.5 to 5.0 lb	2.0 to 4.0	Use for control of annual grasses, broadleaf weeds, and suppression of some perennials. Peach trees must be established at least 6 months in the field prior to use. Apply to soil that is firm and free of depressions in which rain or irrigation water could accumulate. Apply (a) post-harvest in fall or (b) early spring. Use the low rate on coarse textured soils; high rate on fine textured soils. May be tank mixed with simazine or Karmex for broader spectrum weed control. Add Gramoxone Extra for control of emerged weeds.
oxyfluorfen (Goal) 2XL (Galigan) 2E (Oxiflo) 2EC 2.0 lb/gal (Goal Tender) 4EC 4 lb/gal	5 to 8 pt 2.5 to 4 pt	0.5 to 2.0	Apply ONLY to DORMANT bearing and non-bearing trees for control of certain annual broadleaf weeds. DO NOT apply during the growing season or bud swell stage of growth. Has both contact postemergence and residual activity. Use higher rates for preemergence treatments. May be tank mixed with simazine, Devrinol, Surflan, or paraquat.
POSTEMERGENCE			
2,4-D (various generic formulations) 3.8 lb/gal	2 to 3 pt	0.9 to 1.5	Use for control of cool season, annual broadleaf weeds such as dandelion, vetch, and plantains. Do not contact peach foliage, limbs, or stems. Research in North Carolina indicates best results are achieved in winter but <u>before</u> bud-break. Elimination of certain broadleaf weeds may reduce problems with mites and cat-facing insects. DO NOT use on newly planted trees. Some formulations limit rate to only 2 pt/A. Apply no more than twice per year and allow 75 days between applications. See label for details.
glyphosate Various brands and formulations	See product label for rate	0.75 to 2.0	DO NOT apply to trees less than 2 years old. Remove suckers and low hanging limbs at least 2 weeks prior to application. Apply only with hooded sprayer. DO NOT apply later than 90 days after peach tree bloom. Extreme care must be taken to avoid contact with green leaves and trees. Tank mix with preemergence herbicides for residual weed control. Failure to follow all label directions can result in severe tree injury or death. Some generic formulations require the addition of a surfactant.

COMMERCIAL PEACH WEED CONTROL (continued)

USE STAGE AND HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE (cont.)			
paraquat (Firestorm) (Parazone) (Paraquat Concentrate) 3.0 lb/gal	1.75 to 2.7 pt	0.6 to 0.9	Use for broad spectrum, contact control of emerged weeds. Apply as a directed spray in high spray volumes (20+ gpa) with 1 qt surfactant/100 gal of spray solution. Apply when broadleaf weeds and annual grasses are succulent and 1 to 6 in. tall. DO NOT allow spray drift to contact foliage or green bark of trees since severe damage may occur. May be tank mixed with certain preemergence herbicides to provide postemergence and residual weed control. Young, tender bark must be protected from contact with paraquat or severe injury may occur. Paraquat has a 14 day PHI for peaches and a 28 day PHI for nectarines.
(Gramoxone SL) 2 lb/gal	2.5 to 4 pt		
Glyphosate + carfentrazone (Rage)	20 to 99 oz.	0.78 to 3.8	Apply as a direct spray in dormant peach orchards. The addition of a non-ionic surfactant (1 qt./100 gal. of spray solution) or crop oil (1 gal./100 gals. of spray solution) is necessary for optimum herbicide performance. Using in combination with 2 to 4 lbs. of ammonium sulfate per acre will enhance herbicide activity.
Carfentrazone (Aim) 2 lb/gal	0.5 to 2.0 oz.	0.008 to 0.031	Apply alone or tank mix with other herbicides for postemergence control of broadleaf weeds including pigweed, morningglory, lambsquarters and prickly lettuce. Do not allow Aim to contact desirable foliage, flowers, or fruit. Contact with fruit will result in spotting. Do not apply within 3 days of harvest. Best results obtained when applied to weeds in the 2 to 3 leaf stage. Apply in combination with a non-ionic surfactant (1 qt./100 gal of spray solution) or crop oil concentrate (1 gal/100 gal of spray solution).
bentazon (Basagran) 4.0 lb/gal	1.5 to 2.0 pt	0.75 to 1.0	For use in NON-BEARING orchards only. Basagran will provide POST control of certain broadleaf weeds and yellow nutsedge. For yellow nutsedge control apply 2 pts to plants 6-8" tall. A second application 7-10 days later may be necessary. Include crop oil concentrate at a rate of 2 pt/A. Apply in spray volume of 20 to 30 gal/A.
clethodim (Select) 2.0 lb/gal (Intensity) (Select Max, Intensity One) 1 lb/gal	6 to 8 oz 12 to 16 oz.	0.095 to 0.125	Use for control of annual and perennial grasses. Use higher rates for perennial grasses. Add crop oil concentrate (1 qt/A). Make application to johnsongrass-12 to 18 in. tall; bermudagrass-3 in. tall or with 4 to 8 runners; annual grasses - 2 to 8 in. tall. Does not control nutsedge(s). Sequential applications may be necessary to control perennial grass weeds. Select Max has a 14 day PHI, unless otherwise noted on the label all other clethodim formulations are for non-bearing orchards.
fluazifop (Fusilade DX) 2.0 lb/gal	0.75 to 1.5 pt	0.25 to 0.375	Use for control of annual and perennial grasses in BEARING or non-bearing trees. Low spray volumes (10 gpa) generally improve control. Add crop oil concentrate (1 qt/A). Make application to johnsongrass - 12 to 18 in. tall; bermudagrass - 3 in. tall or with 4 to 8 in. runners; annual grasses - 2 to 8 in. tall. Does not control nutsedge(s). Do not apply within 14 days of harvest. Sequential applications may be necessary to control perennial grass weeds.
sethoxydim (Poast) 1.5 lb/gal	1.0 to 2.5 pt	0.19 to 0.47	Use for control of annual and perennial grasses. Low spray volumes (10 gpa) generally improve control. Add crop oil concentrate (1 qt/A). Use low rate on annual grasses up to 6 in. tall; higher rates on larger annual grasses and perennial grasses. Does not control nutsedge(s). Sequential applications may be necessary to control perennial grasses. Do not apply within 25 days of harvest.
MSMA (MSMA 6.6) (MSMA 6.0)	2 ½ pt 2 ⅔ pt	2.06	For use in nonbearing orchards only. Apply to small activity growing weeds. Repeat applications may be necessary for difficult to control weeds like yellow and purple nutsedge. Make no more than 3 applications per season. Do not allow herbicide to contact foliage or bark of trees. Some formulations require the addition of a surfactant. See label for details.
Clopyralid (Stinger or Garrison)	0.33 to 0.66 pt	0.125 to 0.25	Do not apply within 30 days of harvest. Apply in minimum spray volume of 20 GPA. Stinger may be tank mixed with preemergence herbicides. Do not apply more than twice.

PEACH GROWTH REGULATORS

Kathy Taylor, Former Stone Fruit Horticulturist

GIRDLING

RESPONSE	METHOD	TIMING	REMARKS
Advance and concentrate maturity, increase size in early season varieties	<p>In irrigated orchards, girdle scaffold limbs completely with 1/8" or 3/16" knife. In non-irrigated orchards, make an "S" girdle cut (1/2" vertical gap between cut ends). An alternate method worthy of trial is the use of double score cuts (1" apart) that completely encircle the tree. In preliminary use by some growers, the method was found to be equal to girdling but not as damaging to the tree.</p> <p>A new non-injurious method that was used in trial two seasons gave results similar to complete girdling with a 3/16" knife. This method employs scaffold girdling with plastic cable ties.</p>	<p>Final 7-10 days before complete pit hardening, approximately 40 days after full bloom. Tightly apply cable ties to scaffold near crotch during the dormant season (December-February). Remove ties at the last harvest date.</p> <p>Tightly apply cable ties to scaffold near crotch during the dormant season (December-February). Remove ties at the last harvest date.</p>	Girdle only healthy trees at least 4 years old. DO NOT girdle trees under moisture stress. If girdled areas do not heal quickly, a handgun spray for lesser peach tree borer may be necessary.

CHEMICAL THINNING

RESPONSE	MATERIAL	TIMING	RATE OF MATERIAL/ ACRE	REMARKS
Increase fruit size	<p>Many chemical thinning agents have been tested on stone fruits, without consistent results. Some applied during bloom prevent pollination, while others applied at various stages of early fruit development induce excessive fruit abortion.</p> <p>A commonly used thinning agent is Monocarbamide dihydrogensulfate (Wilthin™)</p>	Optimum timing for flower thinning is at 50-60% bloom. (Refer to precautions below).	3-6 qt	Apply using air blast sprayer only. Apply as dilute spray (100-250 gal/A)

Additional considerations and precautions for chemical thinning of peaches.

1. Read and follow all label recommendations.
2. Keep accurate records of the material you use, rate, timing, and effectiveness. Climatic conditions, solution pH, dosage, timing, variety and tree vigor influence the effectiveness. Leave a few trees unsprayed to compare the results of your thinning program.
3. The 4-5 qt rate is usually optimum, but results may vary depending on variety, tree size, and bloom uniformity.
4. Apply only after adequate pollination and fertilization of the early bloom has occurred to ensure a full crop.
5. Direct the air blast spray pattern to the primary fruiting zone of the tree. Shut off the lower nozzles on the spray boom to avoid overthinning of weaker blooms on the lower and inside portions of the trees. A heavier crop can be carried at the top of the tree than in the interior.
6. Additional hand thinning may be required to ensure development of high quality fruit.
7. For the small grower or homeowner, removal of some blooms or immature fruits is best performed by hand or by hitting fruiting wood with a plastic baseball bat. The difficulty with the latter practice is that larger fruit are removed more easily than small fruit. Spacing fruit 6-8 inches apart (with somewhat closer spacing in the top of the tree than in the lower part of the tree) will result in larger fruit.

COMMERCIAL PECAN INSECT CONTROL (BEARING TREES)

Will Hudson, Extension Entomologist

Orchard Survey Procedures

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

PESTICIDE	AMOUNT PER ACRE	PEST, TIMING AND REMARKS
chlorpyrifos 4E (Lorsban, Chlorphos) Centric 40WG Provado 1.6F Trimax Pro	2 pts. 2.0 to 2.5 ozs. 3.5 ozs. 1.3 to 2.6 ozs.	PHYLLOXERA Treat trees with a recent history of heavy infestation and surrounding trees. Apply at budbreak with the first pre-pollination spray. Note: Other imidacloprid formulations are available. Read labels carefully to find the proper rate.
Provado 1.6F Trimax Pro	3.5 ozs. 1.3 to 2.6 ozs.	SPITTLEBUGS Spittlebug infestations are easily recognized by the white, frothy masses on terminals or nut clusters. Definite thresholds have not been established. Many generic imidacloprid formulations are available. Many generic imidacloprid formulations are available.
chlorpyrifos 4E (Lorsban, Chlorphos) or Belt SC or Intrepid 2F or Spintor 2SC or Dimilin 2L or Belay (clothianadin)	1 ½ pts. 3 to 4 ozs. 4 to 8 ozs. 4 to 10 ozs. 8-16 ozs. 3 - 6 oz.	PECAN NUT CASEBEARER Light infestations causing occasional damage do not require control in normal crop years. The most serious damage usually occurs in mid May. Adult emergence should be monitored with pheromone traps. Place traps in orchards by mid April. Begin sampling for nut casebearer in the first week of May. Pay particular attention to orchards not under a spray program the preceding year and orchards with a recent history of nut casebearer problems. Try to time sprays to stop injury before more than one nut per cluster is infested. Make a second application one week later if infestations are heavy. Additional applications may also be needed for second generation nut casebearers in mid June. Several pyrethroid insecticides, including Ammo, Asana, and Fury are labeled for nut casebearer control. It is suggested that they not be used for control of first generation nut casebearers (in May) to avoid aphid exposure to these materials and to conserve beneficial insect populations. (see Special Considerations section.)
Vendex 50W Savey 50DF Envidor 2SC Acramite 4SC Portal Zeal Desperado Nexter (Pyridaben)	1 lb. 3-6 oz. 14-18 oz. 12-16 ozs. 2 pts. 2-3 oz. 1 to 1.1 gal. 5.2 to 10.67 ozs.	MITES Mites, especially the pecan leaf scorch mite, are normally late season pests. Mite damage appears as brown, scorched areas on the undersides of leaflets. Scorched areas begin at the leaflet midribs then spread out toward leaflet margins. Mites often build up on low limbs in the shaded, interior portions of trees then spread rapidly up and out. For heavy infestations, repeat the application in 5 to 7 days. For best results, Vendex should be applied before mites and damage are heavy. Savey is an ovicide, and should be tank-mixed with an adulticide. Zeal is primarily an ovicide/larvicide.
FOLIAR APPLICATIONS imidacloprid (Provado, many generics) pymetrozine (Fulfill) Assail 30SG thiamethoxam (Centric) clothianidin (Belay) Nexter (pyridaben) spirotetramat (Movento) SYSTEMIC APPLICATIONS Admire Pro	see label 4.0 oz. 2.5 to 9.6 ozs. 2.0 to 2.5 oz. 3.0 to 6.0 fl. oz. 5.2 - 10.67 oz. 6.0 – 9.0 oz. 7.0 to 14.0 fl. oz.	YELLOW APHIDS Yellow aphids may be present in orchards throughout the growing season. Populations are usually highest in April-May and again in August-September. In early season, do not treat yellow aphids if they are the only insect problem. Rely on beneficial insects to suppress early season populations. In prolonged dry periods, lower, chronic aphid populations may require treatment to prevent the build-up of unacceptable levels of honeydew and sooty mold. WEEKLY SCOUTING IS VERY IMPORTANT IN TIMING APHID SPRAYS, ESPECIALLY IN LATE SEASON. It is suggested that pyrethroid materials (Asana, Ammo, Fury) not be used, alone or in combination, in early-or mid-season applications. Many generic formulations of imidacloprid are available. Read label carefully for recommended rate. Imidacloprid alone may not control yellow and black-margined aphids. Admire can be applied through a drip irrigation system, as an emitter spot application, or as a shanked-in emitter adjacent application. <u>See label for complete details.</u> Apply Admire only to orchards where drip irrigation has been established for at least five years.

COMMERCIAL PECAN INSECT CONTROL (continued)

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

COMMERCIAL PECAN INSECT CONTROL (continued)

KERNAL FEEDING HEMIPTERANS

(Stink bugs and Plant bugs)

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

FIRE ANTS

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

SCALE INSECTS

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

OTHER INSECT PESTS

Pests such as pecan leaf casebearer, leaf miners, walnut caterpillar, fall webworm, pecan budmoth, nut curculio, shoot curculio, Prionus root borers and others may occasionally cause economic injury to pecan. Growers should be able to identify these pests and their damage. Color photographs of all pecan pests and their injury can be found in Pecan Pest Management in the Southeast (Univ. of Ga. Ext. Ser. Misc. Pub. No. 176), in the Pecan Growers Handbook. The publication is available at \$38.00 per copy from: Ag. Business Office, Conner Hall, The University of Georgia, Athens GA 30602. Specific controls for occasional pests not covered in this spray guide can be obtained from your local County Agent.

SPECIAL CONSIDERATIONS

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

Pest Resistance and Chemical Use. The aphids and mites which attack pecan have demonstrated the ability to become resistant to insecticides applied for their control. The rate at which this resistance develops depends upon the chemical used, the frequency of use, the duration of use, and the rates used. Aphid and mite exposure to effective materials should be minimized to prolong the effective life of the chemicals. It is suggested that no insecticide be applied until it is absolutely necessary (this can be determined by thorough sampling) and that chemicals be alternated as much as possible. 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 unnneeded early-season insecticide sprays conserves existing populations of beneficial insects and reduces the potential for severe aphid problems later in the season. The planting of leguminous cover crops in tree-row middles promotes the build up and retention of lady beetle populations in orchards. Crimson clover and Hairy vetch appear to be two of the best ground covers. If leguminous ground covers are planted, a herbicide strip should be maintained down each tree row and special attention should be paid to the increased water requirements that are likely to exist. Extraneous plant material resulting from the heavy growth of legumes must be removed or broken down prior to harvest or implementation of a program of row middle vegetation suppression (see Weed Control section).

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

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

FOLIAR SPRAYS

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

PECAN CHEMICALS: PRE-HARVEST INTERVALS AND OTHER RESTRICTIONS

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

Table continued on next page

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

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

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

PECAN DISEASE CONTROL

Jason Brock and Tim Brenneman, Department of Plant Pathology

Prepollination Applications:

every 10-14 days from bud break through nut set

	Chemical & Formulation	FRAC Group	Rate/Acre	Comments
Scab; Downy Spot	propiconazole Orbit Propimax EC Bumper 41.8 EC	3	6 - 8.0 fl. oz.	Additional generic products could also be labeled for use on pecan. Before using any product, check the label.
	fenbuconazole Enable 2F	3	8.0 fl. oz.	For best results, tank mix tebuconazole with a surfactant. Do NOT add a surfactant if mixing with other fungicides.
	tebuconazole Folicur 3.6 F Tebuzole 3.6 F Monsoon Orius 3.6 F Toledo 3.6 F	3	6 - 8.0 fl. oz.	
	metaconazole Quash	3	2.5 - 3.5 oz./A	Do not make more than 4 applications per season.
	propiconazole + azoxystrobin Quilt Quilt Xcel	3 & 11 3 & 11	14 -27.5 fl. oz. 14-21 fl. oz.	Use higher rates when disease pressure is severe.
	tebuconazole + trifloxystrobin Absolute	3 & 11	5.0 fl. oz.	
	difenoconazole + azoxystrobin Quadris Top	3 & 11	10 - 14 fl. oz.	
	kresoxim-methyl Sovran	11	2.4 - 3.2 fl. oz.	Do not use Elast on Moore, Van Deman, Barton, or Shawnee.
	pyraclostrobin Headline	11	6.0 - 7.0 fl. oz.	Do not use any surfactant with Elast. Do not use Elast with foliar zinc treatments.
	azoxystrobin Abound	11	6.0-12.0 fl. oz.	
	triphenyltin hydroxide (TPTH) ¹ + FRAC group 3 fungicide	30 3	half rate ² + 4 fl. oz	When conditions are very favorable for scab, use Topsin plus a full rate of TPTH or Elast.
	dodine (Elast 400 F) + FRAC group 3 fungicide	M7	25.0 fl. oz. + half rate	
	dodine (Elast 400 F) + TPTH	M7 30	25.0 fl. oz. + half rate	
	thiophanate methyl ³ + TPTH or + Elast	1 30 M7	1 lb. + ½ rate or 25 fl. oz.	

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

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

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

Potassium phosphite fungicides:

Effectiveness of phosphite fungicides in other cropping systems has varied widely with multiple examples showing either disease suppression or having no effect. These products have shown good activity on anthracnose on other crops, and hopefully they will help control that disease on pecans as well. Initial results indicate they do have some activity on pecan scab. Until we learn more about them, our recommendations are to not replace currently used fungicides with these materials, but to add these in addition to broaden the spectrum of control and enhance the overall efficacy.

Proceed with caution as we learn more about the tolerance of pecans to the phosphites. Some injury has been seen in research plots with higher rates of spray. Basic information such as mixing compatibility is also critical to the success of a product; for the most part the phosphite fungicides have been compatible with other products in the spray tank.

PECAN DISEASE CONTROL (continued)

Postpollination Applications:

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

	Chemical & Formulation	FRAC Code	Rate/Acre	Comments	
Scab	triphenyltin hydroxide (TPTH) ¹ Agri Tin Agri Tin Flowable Super Tin 80WP Super Tin 4L	30	7.5 oz. 12 fl. oz. 7.5 oz. 12 fl. oz.	Do not use any surfactant with Elast. When conditions are very favorable for scab, the rate of either mixing partner can be increased. Increasing the rate of FRAC group 3 fungicides will be important if reduced sensitivity is known or suspected.	
	dodine Elast 400 F	M7	50 fl. oz.		
	Elast + TPTH	M7 30	25 fl. oz + half rate ²		
	Elast + FRAC group 3 fungicide ³	M7 3	25. fl. oz. + 4 – 6 fl. oz.		
	TPTH + FRAC group 3 fungicide	30 3	half rate + 4 - 6 fl. oz		
	propiconazole + azoxystrobin Quilt Quilt Xcel	3 & 11 3 & 11	20- 28 fl.oz. 20-21 fl. oz.		
	tebuconazole + trifloxystrobin Absolute	3 & 11	5 fl. oz.		
	difenoconazole + azoxystrobin Quadris Top	3 & 11	10 - 14 fl. oz.		
	Powdery Mildew	For powdery mildew, the scab fungicide program can be adjusted if needed. The FRAC group 3 fungicides or mixes containing FRAC 3 fungicides are the best options. Combining sulfur (4-6 lbs per acre) with fungicides used for scab control is also an option. Do NOT mix sulfur with Elast.			
	Zonate Leaf Spot	For zonate leaf spot, the scab fungicide program can be adjusted if needed. The FRAC group 3 fungicides or mixes containing FRAC 3 fungicides are the best options. Topsin M also provides suppression of Zonate leaf spot.			

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

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

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

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

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

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

PECAN DISEASE CONTROL (continued)

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.				
	Chemical & Formulation	FRAC Code	Rate/Acre	Comments
Phytophthora Shuck and Kernel Rot	A treatment is advised in orchards with a history of this disease (primarily Houston, Peach, and Macon Counties) when wet weather and warm temperatures <86 °F occur between shell hardening and shuck split.			
	TPTH	30	full rate	
	Potassium phosphite Agri-fos Fosphite Fungi-phite K-Phite Phostrol Rampart Topaz	33	1-3 qts.	
	FRAC Group 11 fungicides	11	full rate	
	copper hydroxide Kocide 3000 Kocide 2000	M1	0.75 - 1.75 lbs. 1.5 - 3.0 lbs	Use higher rates when disease pressure is high and large, mature trees.

Restrictions and Fungicide Resistance Management Recommendations

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

COMMERCIAL PECAN WEED CONTROL

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

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

COMMERCIAL PECAN WEED CONTROL (continued)

USE STAGE / HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE (continued)			
rimsulfuron (Metric) 25 WG (Solida) 25 WG (Pruvin) 25 WG	4 oz	0.063	Provide PRE & POST control of broadleaf and annual grass weeds. For broad spectrum residual control tank mix with diuron, oryzalin, or Prowl H ₂ O. Use in orchards establish at least 1 year. Rimsulfuron has a 14 day PHI for pecan. Sequential applications may be used so long as there is 30 days between applications and total use rate does not exceed 4 oz a broadcast basis.
flumioxazin (Chateau) 51WDG	6 to 12 ozs.	0.19 to 0.38	DO NOT apply more than 6 ozs./A per application to soils having a sand and/or gravel content > 80%. Tree established less than one year must be shielded with a grow tube or waxed container. DO NOT apply second application within 30 days of initial application. Applications after bud break can only be made with shielded application equipment. Once trees break dormancy apply with paraquat or Rely for non-selective postemergence control. Must use shielded application equipment if using in non-dormant pecan trees. Pecans has a 60 day PHI.
indaziflam (Alion) 1.67 SE	5 to 6.5 oz	0.065 to 0.085	Use in orchards establish 3 years or longer. Sequential applications may be used as long as there are 30 days between applications and total use rate does not exceed 10.3 oz/A per year. Alion should be tank mixed with glyphosate, Rely, or paraquat for non-selective POST weed control. Alion has a 14 day PHI.
POSTEMERGENCE			
2,4-D amine (Various generic formulation) 3.8 SL	2 to 3 pt	1 to 1.4	DO NOT apply more than twice a year or within 60 days of harvest. Trees must be at least 1 year old. Do not allow spray to drift onto or contact foliage, fruit, stems, or trunks of trees. DO NOT apply to bare ground. DO NOT apply on light, sandy soils. Past research has shown concerns of injury when applying 2,4-D on sand y soils, immediately before a large rain and during early bud or leaf break. Extreme caution must be taken to avoid off target movement of 2,4-D. Certain crops, like cotton and vegetables, can be severely injured by 2,4-D drift. Some formulations may limit use rate 2 pt/A. See product label for details.
bentazon (Basagran) 4 SL	1.5 to 2 pt	0.75 to 1.0	For use in NON-BEARING pecans only. Basagran will provide POST control of certain broadleaf weeds and yellow nutsedge. For yellow nutsedge control apply 2 pts to plants 6-8" tall. A second application 7-10 days later may be necessary. Include crop oil concentrate at a rate of 2 pt/A. Apply in spray volume of 20 to 30 gal/A.
fluazifop (Fusilade DX) 2 EC 2 lb/gal	8 to 24 fl oz	0.125 to 0.38	Use for control of annual and perennial grasses under bearing or non-bearing trees. Sequential applications will be necessary for control of perennial grass weeds like bermudagrass and johnsongrass. Low spray volumes (10 GPA) generally improve control. Add crop oil concentrate (1.0 qt/A). Make application to johnsongrass-12 to 18 in. tall; bermudagrass-3 in. tall or with 4 to 8 in. runners; annual grasses-2 to 8 in. tall. Does not control nut sedge(s). Do not apply when harvestable nuts are on the ground. Do not graze treated area. Do not apply within 30 days of harvest.
sethoxydim (Poast) 1.5 EC 1.5 lb/gal	1.0 to 2.5 pt	0.3 to 0.5	Use for control of annual and perennial grasses. Sequential applications will be necessary for control of perennial grass weeds like bermudagrass and johnsongrass. Low spray volumes (10 GPA) generally improve control. Add crop oil concentrate (1.0 qt/A). Use low rate on annual grasses up to 6 in. tall; higher rates on larger annual grasses and perennial grasses. Does not control nutsedge(s). Do not harvest within 15 days of application.
clethodim (Select) 2.0 EC (Arrow) 2EC (Intensity) 2EC 2 lb/gal (Select Max) 1 lb/gal (Intensity One) 1 lb/gal	6 to 8 fl oz 12 to 16 oz.		Use for control of annual and perennial grasses in NON-BEARING trees that will not be harvested within 1 year of application. Use higher rates and sequential applications for perennial grasses. Add a non-ionic surfactant containing at least 80% active ingredient at a rate of 1 qt/100 gal of spray solution (0.25% v/v). Make application to johnsongrass-12 to 18 in. tall; bermudagrass-3 in. tall or with 4 to 8 in. runners; annual grasses-2 to 8 in. tall. Does not control nutsedge(s).

COMMERCIAL PECAN WEED CONTROL (continued)

USE STAGE / HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE (continued)			
Glyphosate + carfentrazone (Rage)	20 to 99 oz.	0.78 to 3.8	Apply as directed spray for non-selective postemergence weed control. Do not apply within 3 days of harvest. Application should be made using hooded or shielded application equipment. Use in combination with a non-ionic surfactant (1 qt./100 gal. of spray solution). The addition of ammonium sulfate at 2 to 4 lb. per acre will enhance herbicide activity.
halosulfuron (Sanda) 75 WDG	0.67 to 1.3 3 oz	0.032 to 0.063	For control of nutsedge, pigweed, radish, and cocklebur. Apply as directed spray under trees established for at least one year. Avoid contact of spray with trunk, stem, roots, or tree foliage. May apply up to 2 applications. Do not apply within 1 day of harvest. See label for rate restrictions related to soil texture. Tank mix with glyphosate for broad spectrum control
paraquat (Firestorm) 3 SL (Parazone) (Paraquat Concentrate) 3 lb/gal (Gramoxone SL) 2 lb/gal	1.75 to 2.7 pt 2 to 4 pt	0.65 to 1	Use for broad spectrum, contact control of emerged weeds. Apply as a directed spray in at least 20 gallons of water with 1 to 2 pt surfactant/100 gal of spray mix or 1% crop oil concentrate (1 gal per 100 gal spray mix). Apply when annual weeds are succulent and 1 to 6 in. tall. DO NOT allow spray drift to contact foliage or green bark of trees since severe damage may occur. DO NOT allow animals to graze on treated areas. May be tank mixed with certain preemergence herbicides for effective residual weed control. DO NOT apply when nuts are on the ground.
glufosinate (Rely 280) 2.34 lb/gal	2 to 3 qt	0.75 to 1.5	Use for broad spectrum control of emerged weeds and grasses, both annuals and perennials. Apply as a directed spray in high spray volumes on non-bearing and bearing trees. Possesses contact and limited systemic activity, but does well on wild brambles and perennial grasses. Does not have soil residual activity. DO NOT contact foliage or green bark.
glyphosate acid (numerous brands) 4 SL Roundup Weather Max 5.5 SL	1 to 2 qt 11 to 46 fl oz	1 to 2	Use for broad spectrum control of emerged weeds, both annuals and perennials. Apply as a directed spray on bearing and non-bearing trees. DO NOT allow spray to contact foliage, suckers, or green bark of trees. Use low rate for control of annual weeds less than 12 in. tall. Refer to product label for rates to control specific perennial weeds. Repeat applications may be made. Some glyphosate formulations require the addition of an adjuvant. Do not allow glyphosate to contact bark or leaves. <u>Try to avoid applications in late summer and fall.</u> Trees are more sensitive to glyphosate during that time. Allow at least 3 days between last application and harvest.
Carfentrazone (Aim) 2 lb/gal	0.5 to 2.0 oz.	0.008 to 0.031	Apply alone or tank mix with other herbicides for postemergence control of broadleaf weeds including pigweed, morningglory, lambsquarters and prickly lettuce. Do not allow Aim to contact desirable foliage, flowers, or fruit. Contact with fruit will result in spotting. Do not apply within 3 days of harvest. Best results obtained when applied to weeds in the 2 to 3 leaf stage. Apply in combination with a non-ionic surfactant (1 qt./100 gal of spray solution) or crop oil concentrate (1 gal/100 gal of spray solution).
ROW MIDDLE VEGETATION SUPPRESSION			
glyphosate acid (numerous brands) 4 SL Roundup Weather Max 5.5 SL	2 to 16 fl oz 1.3 to 5.85	0.06 to 0.5 0.06 to 0.25	Use for vegetative suppression in row middles. Apply 1 to 2 weeks after full green-up of bahiagrass or bermudagrass, or after grass has been mowed to a uniform height of 3 to 4 in. Rates should vary depending on vigor of vegetative growth and canopy of the grove, with the higher rates for more vigorous grass stands where less shade occurs. Low spray volumes (10 GPA) improve control. See respective labels for surfactant requirements. Sequential applications can be made to maintain growth suppression and prepare the orchard floor for mechanical harvest. Allow a minimum of 21 days between the last application and harvest.

FOLIAR ZINC SPRAYS FOR BEARING PECAN TREES

Lenny Wells, Extension Horticulturist

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

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

FOLIAR ZINC SPRAYS FOR NON-BEARING PECAN TREES

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

FOLIAR NICKEL SPRAYS FOR BEARING AND NON-BEARING PECAN TREES

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

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

FOLIAR BORON APPLICATION FOR BEARING PECAN TREES

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

COMMERCIAL STRAWBERRY WEED CONTROL

Mark A. Czarnota, Extension Horticulture-Weed Science

USE STAGE / HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREPLANT (plastic culture)			
carfentrazone (Aim EC) 2.0 EC (Aim EW) 1.9 EW	0.5 to 1.6 fl oz	0.008 to 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 inches. Coverage is essential for weed control. Add a non-ionic surfactant at 1 qt per 100 gal of spray mix. May mix with glyphosate.
flumioxazin (Chateau) 51 WDG	3 oz/A	0.09	Excellent product preemergence weed control. Use 3 oz rate for control weeds in row middles. Must be applied with a hooded or shielded sprayer. Do not apply spray to contact foliage, and do not apply after fruit set. Do not apply more than 3 oz /A /year.
paraquat (Gramoxone Inteon) 2 SL	2.0 pt	0.62	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 to 2 pt per 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.
glyphosate Various trade names and formulations are available	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. May make 3 applications per year.
Other fumigation options			Several fumigates are currently being explored for weed control in strawberries, and for the latest information on fumigants for strawberries check with University of California or University of Florida agricultural publications.
PREEMERGENCE^{1,2,3} (plastic culture)			
DCPA (Dacthal) W-75	8 to 12 lb	6 to 9	Control of most annual grasses and small-seeded broadleaf weeds. Also, controls volunteer small grains if applied before emergence. Apply as a banded preemergence treatment to the middles between plastic before weed emergence. Tank mixture with paraquat will provide pre- and post-emergence weed control. Rainfall or irrigation within 24 hr after application is needed for optimum control.
flumioxazin (Chateau) 51 WDG	3 oz/A	0.09	Excellent product for preemergence weed control. Use 3 oz rate for control weeds in row middles. Must be applied a minimum of 30 prior to transplanting strawberries into plastic. Do not apply more than 3 oz /A /year.
oxyfluorfen (Goal) 2XL	1 to 2 pt	0.25 to 0.5	Apply to soil surface of pre-formed beds prior to transplanting crop for broadleaf weed control. Results best when plastic mulch applied immediately after application. Do not incorporate for maximum activity; however, to reduce the potential for crop injury incorporate beds to a depth of 2.5" prior to transplant. Do not transplant within 30 days of application.
POSTEMERGENCE (plastic culture)			
clethodim (Select) 2 EC	6 to 8 fl oz	0.094 to 0.125	Apply postemergence for annual grasses at 6 to 8 oz per acre or bermudagrass and johnsongrass at 8 oz per acre. 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.
clopyralid (Stinger 3.0 lb/gal)	5.3 fl oz	0.124	Do not use a surfactant. Do not tank mix with other herbicides. Do not apply within 30 days of harvest. Make 1 to 2 applications per year not to exceed 10.6 fl oz per acre per 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 Univ. of Georgia has been conducted. Suggest using on minimal acreage initially. Stinger is effective on clovers, cocklebur, dandelion, nightshade, ragweeds, and vetch. Will suppress several thistle species.

COMMERCIAL STRAWBERRY WEED CONTROL (continued)

USE STAGE / HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE (plastic culture)(continued)			
sethoxydim (Poast Plus) 1.53 EC	1.5 to 2.5 pt	0.18 to 0.47	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 concentrate (1 qt/A). Use low rate on annual grasses up to 6 in. tall; higher rates on larger annual grasses and perennial grasses. Repeat application may be made but the total amount applied should not exceed 2.5 pt per season. Do not cultivate 5 days prior to or 7 days after application. Reduced rates (4 to 6 oz/A) may be used to suppress ryegrass growth in the row middles; however, environmental conditions and ryegrass size greatly affect results.
sethoxydim (Poast Plus) 1.53 EC	1.5 to 2.5 pt	0.18 to 0.47	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 concentrate (1 qt/A). Use low rate on annual grasses up to 6 in. tall; higher rates on larger annual grasses and perennial grasses. Repeat application may be made but the total amount applied should not exceed 2.5 pt per season. Do not cultivate 5 days prior to or 7 days after application. Reduced rates (4 to 6 oz/A) may be used to suppress ryegrass growth in the row middles; however, environmental conditions and ryegrass size greatly affect results.
POSTEMERGENCE HOODED OR SHIELDED APPLICATIONS (plastic culture)			
carfentrazone (Aim EC) 2.0 EC (Aim EW) 1.9 EW	0.5 to 1.6 fl oz	0.008 to 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 inches. Coverage is essential for weed control. Add a non-ionic surfactant at 1 qt per 100 gal of spray mix. May mix with glyphosate.
flumioxazin (Chateau) 51 WDG	3 oz/A	0.09	Excellent product preemergence weed control. Use 3 oz rate for control weeds in row middles. Must be applied with a hooded or shielded sprayer. Do not apply spray to contact foliage, and do not apply after fruit set. Do not apply more than 3 oz /A /year.
paraquat (Gramoxone Inteon) 2 SL	2.0 pt	0.62	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 to 2 pt per 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.
glyphosate Various trade names and formulations are available	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. May make 3 applications per year.
PREEMERGENCE^{1,2,3} (matted row)			
carfentrazone (Aim EC) 2.0 EC (Aim EW) 1.9 EW	0.8 to 1.5 fl oz	0.013 to 0.023	For annual broadleaf weeds including morningglory, pigweed, and spiderwort. Apply prior to planting or before crop emergence to weeds less than 3 inches. Coverage is essential for weed control. Add a non-ionic surfactant at 1 qt per 100 gal of spray mix.
DCPA (Dacthal) W-75	8 to 12 lb	6 to 9	For control of most annual grasses and small-seeded broadleaf weeds. Apply over-the-top of newly planted transplants in fall or early spring for preemergence weed control. Do not apply after first bloom through harvest.
flumioxazin (Chateau) 51 WDG	3.0 oz	0.09	Excellent product preemergence weed control. Use 3 oz rate for control weeds in dormant strawberries. A crop oil at 1% v/v or a non-ionic surfactant at 0.25% v/v can be added to help control broadleaf weeds. Do not apply more than 3 oz /A /year.
methyl bromide (various brands)	See label	See label	Inject into the soil 4 to 6 inches deep and cover with black plastic immediately. Soil moisture should be near field capacity and soil temperature should be at least 50°F at the treatment depth. Allow at least 2 weeks after application before transplanting.
napropamide (Devrinol) 50 DF	4 to 8 lb	2 to 4	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.

COMMERCIAL STRAWBERRY WEED CONTROL (continued)

USE STAGE / HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE (matted row)			
clethodim (Select) 2.0 EC	6 to 8 fl oz	0.09 to 0.125	Postemergence grass control. Very effective in controlling annual bluegrass. Add 1% crop oil concentrate to all sprays (1 gal of crop oil concentrate per 100 gallons of spray). DO NOT apply within 4 days of harvest and do not apply more than 8 oz per application.
clethodim (Select Max) 0.97 EC	9 to 16 fl oz	0.068 to 0.121	Controls annual and perennial grasses in bearing plantings. PHI is 4 days. Non-ionic surfactant is recommended at 0.25% V/V. Do not apply more than 64 oz/A / growing season. Sequential applications will be necessary for control of most perennial grass control.
clopypalid (Stinger 3.0 lb/gal)	5.3 fl oz	0.124	Do not use a surfactant. Do not tank mix with other herbicides. Do not apply within 30 days of harvest. Make 1 to 2 applications per year not to exceed 10.6 fl oz per acre per 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 Univ. of Georgia has been conducted. Suggest using on minimal acreage initially.
	5.3 to 10.6 fl oz	0.248	For weed control after harvest to early fall, apply after the majority of basal leaves have emerged but prior to bud stage. Stinger is effective on clovers, cocklebur, dandelion, nightshade, ragweeds, and vetch. Will suppress several thistle species.
fluzifop-p (Fusilade DX) 2 EC	16 to 24 fl oz	0.25 to 0.38	USE ON NONBEARING CROP ONLY. Postemergence grass control. The addition of either a crop oil or nonionic surfactant will be necessary. Do not apply within 1 year of the first harvest.
sethoxydim (Poast) 1.5 EC	1.5 to 2.5 pt	0.18 to 0.47	Postemergence 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.
POSTEMERGENCE HOODED OR SHIELDED APPLICATIONS (matted row)			
carfentrazone (Aim EC) 2.0 EC (Aim EW) 1.9 EW	0.5 to 1.6 fl oz	0.008 to 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 inches. Coverage is essential for weed control. Add a non-ionic surfactant at 1 qt per 100 gal of spray mix. May mix with glyphosate.
glyphosate Various trade names and formulations are available	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.
paraquat (Gramoxone Inteon) 2 SL	2.0 pt	0.62	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 to 2 pt per 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.

¹All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5 to 1.0 inch of water). If no rain event occurs and no supplemental overhead watering is provided after a preemergent herbicide application, weed control can be extremely poor.

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

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

WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS

Wayne E. Mitchem, Extension Weed Scientist

	Alion		Diuron, etc.		Devrinol		Solicam		Sinbar		Prowl		Oryzalin		simazine		Gallery	
Application Method ¹	PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE	
Time of Year ²	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-F	P	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 (seed-ling)			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
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

WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS (continued)

	Alion		Diuron, etc.		Devrinol		Solicam		Sinbar		Prowl		Surflan		Princep, etc.		Gallery	
Application Method ¹	PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE	
Time of Year ²	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
ANNUAL BROADLEAF WEEDS (continued)																		
horseweed	G	G	F	G	P	F	G	G	G	G	P	P	P	P	P	G		G
jimson weed	G		G		P		G		E		P		F		F-G		G	
lambsquarters	E		E		E		F		E		E		E		E		E	
morningglories	G		G		P		F-G		G-E		P		F		F-G		F	
pigweeds	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

¹ PRE = Preemergence.

² S = Spring; F = Fall.

Key to Response Symbols: E = Excellent Control; G = Good Control; F = Fair Control; P = Poor Control.

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 (continued)

	Chateau		MSMA		Oxyfluorfen		Fusilade Clethodim ⁺		glyphosate		Paraquat		2,4-Damine		Poast	
Application Method ¹	PRE		PDS		PRE		PDS		PDS		PDS		PDS		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					F	F	P	P	G	E	F	F	F		P	P
bahiagrass	P	P	F		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	F		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	F-G		P	P	G	P	F	G	F	P	P	P	G	F
nutsedge	P	P	G		F	F	P	P	F	G	F	F	P		P	P
plantains	G	P					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		G		F		G		E		G		P	P	G	
crabgrass	G		G		F		G		E		G		P	P	G	
crowfootgrass	G		G		F		G		E		G		P	P	G	
fall panicum	G		G				G		E		G		P	P	G	
goosegrass	G		G		F		G		E		G		P	P	G	
johnsongrass (seedling)	G		G				E		E		E		P	P	E	
ryegrass, annual		G	F		P		G	G	G	G	F	G	P	P	E	E
sandbur			G		P		G		E		G		P	P	G	
signalgrass, broadleaf	G		F		P		E		E		G		P	P	E	
Texas panicum	G		F		P		E		E		E		P	P	E	
ANNUAL BROADLEAF WEEDS																
bristly starbur	G		F		F-G				G		F-G		G		P	
chickweed	G	G							G	G	F	G	F	F	P	P
cocklebur	G		E		G				E		G		E	E	P	
crotalaria			G		E				E		G		G		P	
croton, tropic	G		F		E				E		F-G		G		P	

WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS (continued)

	Chateau		MSMA		Oxyfluorfen		Fusilade Clethodim ⁺		Glyphosate		Paraquat		2,4-Damine		Poast	
Application Method ¹	PRE		PDS		PRE		PDS		PDS		PDS		PDS		PDS	
Time of Year ²	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
ANNUAL BROADLEAF WEEDS (continued)																
evening primrose	G	G			F	G			P-F	F	F	F-G	F	G		
Florida beggarweed			E		P				E		E		F			
Florida pusley	G		F		E				G		F ³		F		F	F
horseweed	G	G			P	F			G-E	G-E	F*	F	G			P
jimson weed	G		F		G				E		G		E		P	
lambsquarters	G		F		E				G		G		E		P	
morningglories	G		F		F-G				G		G		G		P	
pigweeds	E		F		E				G		G		G		P	
prickly lettuce						G			G	G	F	G	G	G	P	P
prickly sida (teaweed)	G		P		E				G	F	G	P	G		P	
purslane, common	G		F		E				E		G		E		P	
ragweed, common	G		F		E				G		G		E	E	P	
sicklepod			F		F				G		E		E		P	
wild radish	G	G			G-E	E			E	E	F	G	G	G	P	P

¹ PRE = Preemergence; PDS = Post emergence Directed Spray.

² S = Spring; F = Fall.

³ Gramoxone will control only the seedling stages of Florida pusley.

* Gramoxone and Rely provide only contact control of many species.

+ Fusilade and Prism are fluazifop and clethodim, respectively; and have similar activity on most weeds. Weed response also reflects Select herbicide.

Key to Response Symbols: E = Excellent; G = Good Control; F = Fair Control; P = Poor Control.

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WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS (continued)

	Aim		Rely*		Velpar		Sanda		Basagran		Stinger or Clopyr		Matrix		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										
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											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											
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							

WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS (continued)

	Aim		Rely*		Velpar		Sanda		Basagran		Stinger or Clopyr		Matrix		Starane	
Application Method ¹	PRE		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 (continued)																
evening primrose	F-P		G	G	E	E									G	G
Florida beggarweed			G	G	F											
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	
pigweeds	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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