Crop Profile for Blueberries in Arkansas

Prepared: February, 2003
Revised: June, 2003

General Production Information

- **State Rank**: NA
- **Percentage of U.S. Production**: <1%
- **Total acres grown**: 450 acres
- **Blueberry Species Grown**: Blueberry Species Grown: The majority of bearing blueberry acreage is planted to northern highbush cultivars (Vaccinium corymbosum). There are limited planting of rabbiteye (Vaccinium ashei) and southern highbush (Vaccinium corymbosum hybrids) cultivars.
- **Cash Value**: $1,533,000
- **Production Regions**: Most blueberry acreage is concentrated in northern and central Arkansas. Significant production is located in Benton, Carroll, Stone, and Washington counties in northern Arkansas and Crawford, Faulkner, Franklin, Johnson, and White counties in central Arkansas.

Production Methods

Commercial blueberry production in Arkansas requires fairly specific climate and soil conditions. The area of the state in which a blueberry species is grown is related to temperature during the growing season. Northern highbush cultivars require cooler conditions while southern highbush and rabbiteye cultivars are more tolerant of higher temperatures. Northern Arkansas is the southernmost region of adaptation for northern highbush blueberries. Central Arkansas and Crowley's Ridge are transition areas where northern highbush cultivars can be grown at high elevation and southern highbush or rabbiteye cultivars can be grown at low elevation. In southern Arkansas, southern highbush or rabbiteye cultivars are grown.

The most favorable soils for blueberries are well-drained, sandy to sandy-loam soils having low pH and high organic matter content. Soils in Arkansas do not naturally possess these characteristics so soil modification is necessary for successful blueberry production. The optimum soil pH range is 4.8 to 5.3. This pH is often obtained by treatment of soil with sulfur to lower pH. Other modifications used in the production system for blueberries in Arkansas are planting on raised beds, addition of peat moss at planting, mulching to maintain 4-6 inches of mulch in the row, and drip irrigation to maintain adequate soil moisture.

One-year or two-year old plants are established at 3 to 4 feet in rows and 10 to 12 feet between rows. Plants produce a small crop in the third season and should be full production (5000 lbs./acre) 5-6 years after planting. At least two cultivars are established in each planting to insure cross pollination that increases berry size and yield. Blueberry bushes are pruned annually to remove dead wood, older canes, and small growth with inferior fruit buds (thinning). This procedure maintains plant vigor, increases yield, improves fruit quality, reduces disease inoculum, and lowers populations of insect pests. Fertilizer is applied annually based on previous season foliar analysis and plant growth.

Commodity Destination(s)

- Fresh Market 80%
- Processing 20%

The Crop Profile/PMSP database, including this document, is supported by USDA NIFA.

Cultural Practices

Worker Activities

Virtually all blueberry plants are pruned by hand during the dormant season. Most of the acres are mulched with mechanical application to the row. The final spreading of mulch is accomplished by hand labor.

Preemergent herbicide applications are applied in early spring, primarily with tractor mounted spray equipment. Postemergence herbicide applications (usually two applications) are made in early summer and occasionally after harvest primarily with backpack sprayers although tractor mounted sprayers are occasionally used. Row middles are mowed throughout the growing season. Hand weeding during July and August is performed on approximately 20% of the blueberry acres.

Insecticides and fungicides are applied from early spring up to harvest primarily with orchard blast sprayers.

The majority of blueberry acres (approximately 85%) are harvested by hand (May – July) although a few of the larger operations use mechanical pickers.

Insect Pests

Insect pest problems on blueberry in Arkansas are very localized and do not exist in most plantings. To date, many growers have experienced some cutworm problems and have sprayed. All other potential pests have caused less than 5% fruit damage and rarely required chemical control.

Possible Major Pests

Climbing Cutworms

Lepidoptera: Noctuidae

The buds of blueberry plants may be attacked and destroyed by cutworms. The extent of damage varies from year to year and site to site. Cutworms are nocturnal and feed on swollen buds during the evening hours, and hide under vegetation or stones or burrow into the ground in the daytime. Cutworms are plump, smooth, dull-colored and often, greasy-looking larvae up to 1 3/4 inches in length. Typically, cutworms curl up tightly when disturbed. The extent of damage varies from year to year and site to site.

Monitoring: At bud swell begin daily scouting for insects at dusk with a flashlight or look for damaged buds during day.

Control: The current recommendation is to apply Sevin directly to parts of the planting where damage occurs. Scout for the insect problem before you spray.

Cranberry fruitworm and Cherry fruitworm

Acrobasis vaccinii and *Grapholita packardi*

Cranberry fruitworm may be treated preventatively or as needed. If left untreated, this pest can be damaging occasionally. Infestations commonly develop from fruit set to 4 – 6 weeks after fruit set. Cranberry fruitworm is easily controlled with minimal crop injury if infestations are observed and insecticides applied early. Insecticide applications must be avoided during bloom to allow bee pollination.

Monitoring: Scout weekly for insect damage after fruit set.

Control: Scout for the insect problem before you spray. Asana, Confirm, Lannate, Malathion, and Sevin are all registered for control of Fruitworms.

Sharpnosed leafhopper

Scaphytopius magdalensis

The sharpnosed leafhopper is regarded as the most serious of these pests because it transmits a mycoplasma that causes blueberry stunt disease. **To date, stunt disease does not cause much damage in Arkansas.** Leafhoppers are abundant in the woods where they feed on wild blueberries and other Ericaceae. They complete three generations per year.

Monitoring: Scout for the presence of blueberry stunt disease and rogue out the diseased plants.

Control: Natural host-plant resistance to the leafhopper has been found in several commercial cultivars of the rabbiteye blueberry. Fruitworm sprays usually control the first generation of leafhopper after petal-fall.

Japanese beetles

Popillia japonica

This beetle has recently become established in several areas of Arkansas and reports have been made concerning fruit damage in 2001. Adults are about 1/2 inch long and shiny metallic green with a series of white spots on abdomen edge. They emerge from pupal chambers in the soil from mid-June through July. They cause direct fruit injury and can skeletonize leaves. They feed on hundreds of other kinds of plants also. Eggs are laid in the ground. After hatching, the larvae feed on roots of grasses and other plants. The winter is spent as partially grown larvae. Larval feeding continues in the following spring. Pupation begins in late May, with adult emergence following later in the June. Japanese beetles could be a problem as fruit feeders in late-maturing blueberries.

Symptoms: Beetle larvae are serious pests of lawns, vegetables, and nursery stock. Adult beetles chew holes in the fruit, making the fruit susceptible to infection. Beetles can cause significant leaf damage which appears as skeletonization. They are difficult to control because the beetles continue to invade plantings for extended periods.

Monitoring: No thresholds are currently in use within the commercial industry. There are commercial traps available for the adult Japanese beetle. These traps have two lures and a collection bag attached to a yellow funnel configuration.

Biological Control: No commercially effective controls are available for the adult beetle.

Control: Insect problems on blueberries in Arkansas are very localized and may not exist in most plantings. Imidan, Malathion, Pyrellin or Sevin are recommended compounds in Arkansas

Possible Minor Pests

Bagworms

Thyridopteryx ephemeraeformis

Bagworms form brown spindle-shaped bags one to two inches long made of plant material and silk. These bags are obvious during the wintertime on their evergreen and deciduous hosts. The overwintering bags contain eggs that hatch into larvae (caterpillars) over a period of about two weeks in early June. Newly hatched larvae begin feeding at the hatching site and some get ballooned by a silken thread to nearby plants where they land and begin feeding. Since the caterpillars are the mobile stage of bagworms, populations may be concentrated on one plant or adjacent plants. Newly hatched caterpillars may be easily overlooked. The caterpillars feed on foliage near the old bag and construct a new bag with silken threads and bits of foliage taken from the host plant. Bags differ in appearance because of the plant material on which the bagworms are feeding. The caterpillars add plant material to the bag as they feed. Accordingly, the bags grow in size as the caterpillars grow. Young bags tend to point upwards whereas older bags hang downward. When full grown (in late summer), the caterpillars enter the pupal or resting stage inside the bags and later develop into adult moths. The winged, black furry males leave the bags and fly in search of virgin female moths. The wingless and almost legless female moths stay in the bags and emit a pheromone (odor) that attracts males for mating. Mated females lay 500 or more eggs inside the bags and then she dies. The eggs overwinter in the bag. There is one generation of bagworms a year in Arkansas.

Mechanical management: Mechanically remove and destroy overwintering bags. This is an effective and environmentally friendly method of control.

Control: Begin scouting the planting for bags in mid-June. If chemical control is necessary, it should be initiated while the caterpillars are small, soon after all eggs have hatched. While winter pruning, it is easier to simply pick off the bags and destroy them.

Fall Webworm

Hyphantria cunea Drury

Fall Webworm is most often discovered when the unsightly, light gray, silken webs appear in the planting in June (1st brood) and August (2nd brood). Webworms enclose leaves and small branches in their nests, unlike the tent caterpillars, which make a smaller nest in the crotch of branches. The caterpillars remain inside the webbing, and if food runs out new foliage is encased. The caterpillars are covered with long white to yellowish tan hairs. The caterpillars make distinct jerking movements in unison if the nest is disturbed.

Mechanical Control – It is best to prune off or pick off the nests and larvae and destroy while they are still small. Do not burn or torch the nests as this may do additional damage to the plants.

Biological Control - Apply *Bacillus thuringiensis* (*Bt*) - The bacterial insecticide, *Bt*, is quite effective against fall webworms if it is applied when the larvae are small. Use formulations with UV protectants and thoroughly cover leaves next to nests. As these leaves are incorporated into the nest and eaten, the *Bt* will be ingested.

Control: Scout for the nests in June and again in August. Though the webs are very unsightly, damage to most plants is considered to be insignificant if found early and removed.

Yellow-necked Caterpillar

Datana ministra Drury

Description: The yellow-necked caterpillar can feed on blueberry plants. Full-grown larvae of the yellow-necked caterpillar are about 2 inches long with a black body and black head. A bright orange-yellow spot characterizes the "neck" area behind the head. The remainder of the body is marked with four longitudinal yellow stripes interspersed with black, and the entire body is clothed with long, soft, white hairs. The larvae are gregarious and feed in large colonies on leaves near the tips of twigs and branches. Occasional outbreaks of the yellow-necked caterpillar may completely defoliate one of more plants.

Monitoring: Defoliating caterpillars are easily scouted for in June or July.

Control: Spray whole plants to kill the localized aggregation of caterpillars. However, it may be faster to remove larvae by hand than to spray.

Insecticides Labeled for Blueberry

Carbaryl

- Formulations: Sevin 50WP, 80 S, 4EC, 50WP
- Target pests: Cherry and Cranberry fruitworm, Japanese beetle, Cutworms (50 WP)
- Average rate of most common formulations:
  -- Sevin 4F (1.5-2 qt/A) Petal fall and additional covers
  -- Sevin 80 S (1.9-2.5 lb/A), Petal fall and additional covers
  -- Sevin 50 WP (3 lb/100 gal water), Bud swell
  -- Sevin 4EC (1.5-2 qt/A), Petal fall and additional covers
- Preharvest interval: 7 days
- Restricted entry interval: 12 hours

Esfenvalerate

- Formulations: Asana XL 0.66EC
- Target pests: Fruitworms
- Average rate of most common formulation:
  -- Asana XL 0.66 EC (4.8-9.6 fl oz /100 gal)
- Preharvest interval: 21 days
- Restricted entry interval: 12 hours

Malathion

- Formulations: Malathion 8F, 25 WP or 8 EC
- Target pests: Japanese beetle, Cherry and Cranberry fruitworm, Sharpnosed leafhopper
- Average rate of most common formulations:
  -- Malathion 8F (1.5-2.5 pt/A)
  -- Malathion 25WP (8 lb/A)
  -- Malathion 8EC (1.5-2.5 pt/A)
- Preharvest interval: 1 day
- Restricted entry interval: 12 hours

Phosmet

- Formulations: Imidan 70 WP
- Target pests: Cherry and Cranberry fruitworm, Japanese beetle
- Average rate of most common formulation:
  -- Imidan 70WP (1.3 lb/A)
- Preharvest interval: 3 days
- Restricted entry interval: 24 hours

Tebufenozide

- Formulations: Confirm 2F
- Target pests: Cherry and Cranberry fruitworm
- Average rate of most common formulation:
  -- Confirm 2F (16 fl oz/A)
- Preharvest interval: 14 days
- Restricted entry interval: 4 hours

Methomyl

- Formulations: Lannate LV (2.4 EC), Lannate 90SF
- Target pests: Cherry and Cranberry fruitworm
- Average rate of most common formulation:
  -- Lannate LV (1.5-3 pt/A)
  -- Lannate 90SF (8-16 oz/A)
- Preharvest interval: 3 days
- Restricted entry interval: 48 hours

Pyrethrin

- Formulations: Pyrellin EC or Pyronyl
- Target pests: Japanese beetle
- Average rate of most common formulations:
  -- Pyrellin EC (1-2 pt/A)
  -- Pyronyl (12 fl oz/A)
- Preharvest interval: 0 days
- Restricted entry interval: 12 hours

Insecticides Used on Blueberries

Crop	Class	Insecticide	Trade Name	% Acres Treated as reported by growers in 1991	% Acres Treated in 2002	Avgerage # Applications
Blueberry	Insecticide	Carbaryl	Sevin 50WP or 80S or 4EC or 50WP	47	30	1
Blueberry	Insecticide	Malathion	Malathion 8F or 25 WP or 8EC	6	20	1
Blueberry	Insecticide	Phosmet	Imidan 70WP	Not reported	5	1
Blueberry	Insecticide	Diazinon	Diazinon	2	3	1
Blueberry	Insecticide	Methoxychlor	Marlate	1	1	1

Diseases

Stem Canker and **Stem Blight**
Botryosphaeria corticis and *B. dothidea*

Symptoms of stem canker first appear as small red lesions on succulent stems. Lesions become swollen and broadly conical within six months. Symptoms vary with the susceptibility of the cultivar. Numerous fruiting bodies of the pathogen occur in cankers of susceptible cultivars. Stems of current season growth are infected in late spring during wet weather and spread by wind throughout the planting. After cankers develop the stem can become girdled and will eventually die. In resistant cultivars, the fungus is restricted to outer portions of the stem, and those cankers are small raised lesions.

Stem blight is commonly known as dieback. Early symptoms will show up as yellowing and reddened or drying leaves on one or more branches. The most obvious clue is a dead branch among live branches. Infection near the ends of twigs can be confused with winter injury. Inoculum is present throughout the growing season in the south, with levels highest in June and July. This fungus enters the plant through wound sites. Most infections occur in the early part of the growing season. Infected plants begin showing symptoms about 4-6 weeks after infection takes place.

Cultural control: Planting resistant cultivars and using disease-free cutting wood in the establishment of new fields best controls stem blight and stem canker.

Control: Planting resistant cultivars and using disease-free cutting wood in the establishment of new fields best controls stem blight and stem canker. Selective pruning of old and diseased wood can reduce inoculum for stem blight, and stem canker. Dormant application of lime sulfur is recommended. Entire plant removal of known infected plants will help prevent the spread of this fungus.

Twig Blight

Phomopsis vaccinii

The primary symptom is the blighting of one-year-old woody stems bearing flowering buds. The fungus enters the plant through the flower buds from overwintering inoculum spread by spring rains. The fungus then rapidly moves into the stem tissue. When the infection reaches the crown of the plant the stems will become girdled. This causes them to wilt and die. Infected twigs become crooked and the pith will be discolored, similar to cold injury symptoms. Infected fruit are usually soft, split and leak.

Cultural control: Establish planting in well-drained soil.

Chemical controls: Apply Lime sulfur solution at delayed dormant stage after leaf buds begin to break. Apply using 5-6 gal/100-150 gal of spray/A. Do not use within 14 days of an oil spray or when temperatures are above 75° F, as it will burn the foliage. *Phomopsis* blight can also controlled with two or three applications of benomyl at 7- to 10-day intervals from bud swell through full bloom. Selective pruning of old and diseased wood can reduce inoculum for twig blight.

Mummy Berry

Monilinia vaccinii-corymbosi

Mummy berry is caused by the fungus Monilinia vaccinii-corymbosi, and is an important disease in Blueberries. The pathogen infects and blights young, expanding, foliar and floral tissue. Spores produced on the blighted twigs then infect open flowers, which leads to internal colonization of the developing fruit. The first few weeks following bud break are critical in the infection cycles of mummy berry. During ripening, infected fruit harden due to the development of fungal survival structures within them. Because of their hard texture, mummy berries are unfit for processing; even low levels of infection can result in the rejection of entire fruit loads if mummy berry is

detected in the packinghouse.

Cultural control: Burying mummies with more than one inch of soil has been reported to prevent their germination and reduce disease. Spores of the pathogen may originate from native species of blueberry, thus providing an additional source of inoculum.

Postharvest control: A large percentage of infected fruit is removed during standard postharvest sorting and separation procedures in the packinghouse. However, the level of separation achieved with current technology is not sufficient.

Chemical controls: We currently have a section 18 usage for Indar until April 2004 for control of Mummy berry in Blueberry. These sprays also have important side effects against Botrytis flower blight, twig blight, and fruit rots.

Phytophthora Root Rot

Phytophthora cinnamomi

Phytophthora root rot occurs in excessively wet areas and is controlled by improving drainage. This disease is more severe in southern highbush cultivars than in rabbiteye cultivars. Above ground symptoms are yellowing of leaves, necrosis of roots and little new growth. Below ground symptoms will vary from slight necrosis of young roots to discoloration of crown area. There are four spore stages to this fungus. Infection occurs rapidly. Abundant soil moisture will favor root infection.

Cultural controls: Improved drainage for control of Phytophthora root rot by planting on raised beds and ditching around fields.

Chemical controls -- Phytophthora root rot can be controlled partially through drenches of metalaxyl (Ridomil Gold). On new plantings, do not apply more than 0.9 gal/A broadcast during the 12 months before bearing harvestable fruit or illegal residues may result.

Botrytis Blossom Blight

Botrytis cinerea

Botrytis flower blight is more severe when cool, wet weather follows freeze damage during bloom. Twig blight, which may be caused by several fungal genera including Phomopsis and Botrytis, can develop to epidemic proportions in bushes subjected to abiotic stress or mechanical injury. This fungus attack green twigs, blossoms, leaves and fruit. Older parts of the plant are rarely affected. Infected twigs turn brown to black then lighten to a tan or gray color. It is easily mistaken for winter injury. The fruit rot phase will not develop until after the berries are harvested. Leaves that are attacked will become chlorotic then turn light brown.

Cultural control: There are no cultural controls for flower blight. Twig blight can be reduced by alleviating stresses (e.g., drought), reducing mechanical injury to bushes (e.g., during harvest), and by careful pruning.

Chemical controls: Currently this disease is controlled partly with chemical applications at bloom. Iprodione (Rovral) plus captan can be applied up to four times from early bloom through harvest.

Anthracnose Fruit Rot

Colletotrichum gloeosporioides Penz.

The common name for this disease is ripe rot since it occurs on blueberries as the mature and

ripen for harvest. Symptoms first appear as a blight of the blossoms. Infected fruit remain symptomless until they mature. Then the blossom end softens and becomes sunken with masses of salmon-colored conidia. This fungus can also infect leaves. Fruit are susceptible during all stages of growth. Losses are more severe during prolonged periods of warm wet weather.

Chemical controls: Captan or lime sulfur are currently used for Anthracnose control in blueberries.

Fungicides Labeled for Blueberry

Captan

- Formulations: Captan 50WP
- Target pests: Stem canker, Stem blight, Mummy berry, Botrytis blight, Anthracnose
- Average rate of most common formulation:
  -- Captan 50WP (1 lb/A)
- Preharvest interval: 0 days
- Restricted entry interval: 72 hours

Fenbuconazole -Section 18 usage until April 2004

- Formulations: Indar 75WSP
- Target pests: Mummyberry
- Average rate of most common formulation:
  --Indar 75W (2 oz/A)
- Preharvest interval: 0 days
- Restricted entry interval: 12 hours
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Lime Sulfur

- Formulations: Orthorix, Miller Lime Sulfur
- Target pests: Anthracnose, Cane blight
- Average rate of most common formulation:
  -- liquid lime sulfur (8 gal/A), delayed dormant
- Preharvest interval: Delayed dormant spray
- Restricted entry interval: 48 hours

Metalaxyl

- Formulations: Ridomil Gold EC
- Target pests: Phytophthora root rot
- Average rate of most common formulation:
- Established plantings:
  -- Ridomil Gold EC (¼ pt/1000 linear feet of row) or (3.6 pts/A) broadcast basis) in a 3ft band over the row before the plants start growth in the spring. An application may be made to coincide with periods most favorable for root rot development.
- New plantings:
  -- Ridomil Gold EC (3.6 pt/A) broadcast at or after the time of planting.
- Preharvest interval: 45 days
- Restricted entry interval: 12 hours

Fungicides Used on Blueberries

Crop	Class	Fungicide	Trade Name	% Acres Treated as reported by	% Acres Treated In 2002	Avgerage # Applications

				growers in 1991		
Blueberry	Fungicide	Captan	Captan 50WP	25	40	1
Blueberry	Fungicide	Fenbuconazole	Indar 75WSP	Not labeled in 1991(Sec.18 in 2002)	5	2
Blueberry	Fungicide	Lime sulfur	Orthorix, Miller Lime Sulfur	Not reported	40	1
Blueberry	Fungicide	Metalaxyl	Ridomil	2		1
Blueberry	Fungicide	Benomyl	Benlate	15	76	1

Weeds

Weed control in blueberries is essential if optimum growth and yield are to be obtained. Weeds compete with blueberry plants for moisture, sunlight and nutrients. In addition, weeds may reduce spray penetration into the canopy, reduce air movement and drying of moisture from the surface of plant tissues and interfere with harvest operations. Controlling weeds in blueberries is challenging and requires an integrated program for success. The two components of an integrated system for blueberry weed control are cultural practices and use of herbicides. Cultural practices used are mulching, manual weed removal, and use of a cover crop in row middles. Mulching is used to suppress weeds in the blueberry row. Other benefits of mulching include addition of organic matter to soil, insulation of blueberry roots, and conservation of moisture in the root zone. Hand removal of weeds is used in conjunction with herbicides to control perennial weeds in the plant row. Row middles are planted to a cover crop such as tall fescue to reduce intrusion of weeds into the plant row, prevent erosion, provide a "platform" for operations during wet conditions, and add organic matter to the soil. Grass cover cops are mowed as needed during the growing season. Use of cultural practices alone will result in incomplete weed control and higher farming costs. Consequently, a herbicide program is used in addition to cultural practices to reduce costs and achieve optimum weed control.

Herbicides on Blueberry

Preemergence Control

Dichlobenil

- Formulations: Casoran 4G or Norosac 4G
- Target weeds: grasses and broadleaf weeds
- Application: Single application of 100 to 150 lb./ acre soil surface applied between November 15 and February 15 to weed free soil.
- Restricted entry interval: 12 hours
- Comments: Do not apply until 4 weeks after planting.

Diuron

- Formulations: Karmex DF
- Target weeds: grasses and broadleaf weeds

- Application: Single application of 2-4 lb. in 25-40 or more gallons of water/acre applied in spring before weeds emerge or multiple application of 2 lb. in fall followed by 2 lb. again in spring.
- Restricted entry interval: 12 hours
- Comments: Apply only to plants established one year or more.

Isoxaben

- Formulations: Gallery 75DF, Gallery T & V
- Target weeds: grasses and broadleaf weeds
- Application: Single application of 0.66 – 1.33 lb. in a minimum of 10 gallons of water/acre. Apply in late summer to early fall or in early spring prior to weed germination or immediately after cultivation.
- Restricted entry interval: 12 hours
- Comments: Do not apply to newly planted blueberry plants until soil has settled. Rainfall/irrigation required within 21 days. For non-bearing blueberry plantings only, do not use within one year of harvest.

Napropamide

- Formulations: Devrinol 50 DF
- Target weeds: grasses and broadleaf weeds
- Application: Single application of 8 lb. in at least 20 gallons of water/acre. Apply to the base of plants in late fall to spring on weed free soil.
- Restricted entry interval: 12 hours
- Comments: May be applied to newly planted (non-bearing) or established (bearing) plants. Requires sufficient irrigation or rainfall to wet the soil to a depth of 4 inches within 24 hours of application for incorporation. Do not allow spray to contact fruit or foliage.

Norflurazon

- Formulations: Solicam 80 DF
- Target weeds: grasses and broadleaf weeds
- Application: Single application of 2.5 lb. (sandy or light-colored soil) to 5 lb. (heavy or dark-colored soil) in at least 20 gallons of water/acre. Apply to clean soil surface from fall to early spring.
- Restricted entry interval: 12 hours
- Comments: Apply only to plants established 6 months or more. Requires rainfall or irrigation within 4 weeks of application for product activation. Continual use of Solicam can lead to buildup in the soil with subsequent growth reduction. Rotate to other herbicides if yellow-white leaf veins or stems occur.

Oryzalin

- Formulations: Surflan 4 AS or Oryzalin 4 AS
- Target weeds: grasses and broadleaf weeds
- Application: Single application of 2.0 to 4.0 qt. in 20 to 40 gallons of water/acre applied as a single band or broadcast application to the soil beneath bushes before weeds emerge.
- Restricted entry interval: 12 hours
- Comments: May be applied to newly planted (non-bearing) or established (bearing) plants. Requires rainfall or irrigation of 0.5 to 1.0 inches to activate product. Do not spray foliage or fruit.

Pronamide

- Formulations: Kerb 50WP
- Target weeds: grasses and broadleaf weeds
- Application: Single application of 2.0 to 8.0 lb. in 20 to 40 gallons of water/acre. Apply in

winter when soil is not frozen. Best weed control results occur under cool conditions (less than 55° F).
- Restricted entry interval: 12 hours
- Comments: Do not apply to fall-planted bushes less than one year old or to spring-planted bushes less than 6 months old. Make only one application per year and do not exceed 4 lb. per acre per year. Restricted use pesticide.

Simazine

- Formulations: Princep 4L, Princep 90WDG
- Target weeds: annual broadleaf weeds
- Application: Single application of 2 to 5 lbs./treated acre(90WDG); 2 to 4 qt./treated acre(4L). Apply in the fall or early spring before weeds emerge and canes leaf out or as a split application of 2.5 lb. in fall followed by 2.5 lb. in spring..
- Restricted entry interval: 12 hours
- Comments: Do not apply to sandy, loamy sand, gravelly soils, or exposed subsoils. Use ½ rate on plants less than 6 months old. Do not apply when fruit is present or illegal residues may result.

Terbacil

- Formulations: Sinbar 80W
- Target weeds: grasses and broadleaf weeds
- Application: Single application of 2.0 lb. (lighter soils) to 4 lb. (heavier soils) per acre in a minimum of 20 gallons of water. Apply in fall or early spring before weed growth begins.
- Restricted entry interval: 12 hours
- Comments: Apply only to plants established one year or more. Avoid contact of foliage or fruit with spray. Do not use on soils of less than 2% organic matter or where roots are exposed.

Postemergence Control

Clethodim

- Formulations: Select 2EC
- Target weeds: grasses
- Application: Apply as multiple applications (2-4) in established plantings as a directed spray to actively growing weeds. Apply 6 to 16 fl. oz./ acre plus crop oil concentrate containing at least 15% emulsifier at 1% v/v
- Restricted entry interval: 12 hours
- Comments: May be applied as a spot treatment. May require sequential applications for perennial grass control. Grasses need to be actively growing. For use in non-bearing plantings that will not be harvested within one year of treatment.

Fluaziflop

- Formulations: Fusilade DX 2EC
- Target weeds: grasses
- Application: Apply as multiple applications (2-4) in established plantings as a directed spray to actively growing weeds. Apply 1.0 to 1.5 pt. with crop oil concentrate at 1 qt. in a minimum of 25 gallons of water/acre.
- Restricted entry interval: 12 hours
- Comments: Do not apply if rainfall is expected within one hour of application. Low spray volumes (10gpa) generally improve control. Do not apply to plants that will be harvested within one year.

Glyphosate

- Formulations: Roundup Ultra
- Target weeds: grasses and broadleaf weeds
- Application: Apply as a single preplant broadcast application to control perennial weeds prior to establishment or as multiple applications (2-4) in established plantings as a directed spray or wiper application (20% solution in water) to actively growing weeds. Apply 0.5 to 5 qt. in 10-40 gallons of water/acre depending on weed species.
- Restricted entry interval: 12 hours
- Comments: Do not allow spray to contact desirable vegetation, including green shoots, canes, or foliage. Do not apply within 14 days of harvest.

Paraquat

- Formulations: Gramoxone Extra
- Target weeds: grasses and broadleaf weeds
- Application: Multiple applications (2-4) of 2.0 to 3.0 pt. in 30 to 100 gallons of water/acre. Apply as a directed spray to weeds before new canes emerge. Do not allow spray to contact desirable vegetation, including green shoots or foliage, as severe damage will result.
- Restricted entry interval: 12 hours
- Comments: Use low pressure during application to produce a coarse spray. Add non-ionic surfactant at 1-2 pt. or crop oil at one gallon per 100 gallons of water for best results. Restricted use pesticide.

Sethoxydim

- Formulations: Poast EC
- Target weeds: grasses
- Application: Multiple applications (2-3) of 1.5 to 2.5 pt. plus 2 pt. of a crop oil concentrate in 10-20 gallons of water/acre. Apply as a directed spray when grass is actively growing.
- Restricted entry interval: 12 hours
- Comments: Do not apply more than 2.5 pt. per application or 5 pt. per season. May be applied to newly planted (non-bearing) or established (bearing) plants.

Sulfosate

- Formulations: Touchdown 5
- Target weeds: grasses and broadleaf weeds
- Application: Apply as a single preplant broadcast application to control perennial weeds prior to establishment or as multiple applications (2-4) in established plantings as a directed spray or wiper application (20% solution in water) to actively growing weeds. Use an approved surfactant or wetting agent containing at least 75% active ingredient at 2 qt. per 100 gallons of water to improve coverage of weed foliage. Up to 6.4 pt. in 10-30 gallons of water/acre/year depending on weed species.
- Restricted entry interval: 12 hours
- Comments: Do not apply within one year of harvest. Spray contact with any plant part other than mature, brown woody bark may cause injury.

Herbicides Used on Blueberries

Crop	Class	Herbicide	Trade Name(s)	% Acres Treated as reported by growers in 1991	% Acres Treated in 2002	Avgerage # Applications

Blueberry	Herbicide	Diuron	Karmex 80WDG	49	25	1
Blueberry	Herbicide	Fluazifop	Fusilade DX 2EC	7	10	1
Blueberry	Herbicide	Glyphosate	Roundup Ultra	46	50	1
Blueberry	Herbicide	Isoxaben	Gallery 75DF, Gallery T&V	Not reported		1
Blueberry	Herbicide	Naproamide	Devrinol 50DF	0.2	5	1
Blueberry	Herbicide	Norflurazon	Solicam 80DF	0.9	5	1
Blueberry	Herbicide	Oryzalin	Surflan 4AS, Oryzalin 4AS	22	50	1
Blueberry	Herbicide	Paraquat	Gramoxone Extra, BOA	23	50	2
Blueberry	Herbicide	Pronamide	Kerb	Not reported		1
Blueberry	Herbicide	Sethoxydim	Poast EC	12	25	
Blueberry	Herbicide	Simazine	Princep 4L, Princep 90WDG	21	45	1
Blueberry	Herbicide	Sulfosate	Touchdown 5	Not reported	5	1
Blueberry	Herbicide	Terbacil	Sinbar 80WP	48	5	1

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References

1. American Phytopathological Society. 1995. Compendium of Blueberry and Cranberry Diseases. APS Press, St. Paul, MN. 87 pp.

2. Boyd, J. and P. Spradley. 1985. Blueberry weed control. Univ. of Ark. Coop. Ext. Ser. Fact Sheet 6000. 4 pp.

3. Carter, P.M., J.R. Clark, and R.K. Striegler. 2002. Evaluation of southern highbush blueberry cultivars for production in southwestern Arkansas. HortTechnology 12(2): 271-274.

4. Klugh, B.F. and D. Rundle. 2003. Arkansas Statistical Summary – Fruits/Nuts/Vegetables. Arkansas Agricultural Statistics Service, Little Rock, AR.

5. Moore, J.N. 1970. Blueberry variety performance in Arkansas. Ark. Agr. Expt. Sta. Report Series 186. 17 pp.

6. Ohio State University. 1997. Midwest Small Fruit Pest Management Handbook. Ohio State

University Coop. Ext. Bull. 861. 713 pp.

7. Patterson, W.K. 1997. Growing blueberries. Univ. of Ark. Coop. Ext. Ser. Fact Sheet 6038. 5 pp.

8. Scott, R.C., J.W. Boyd, and K.L. Smith. 2003. Recommended chemicals for weed and brush control. Univ. of Ark. Coop. Ext. Ser. Misc. Publication 44. 154 pp.

9. Striegler, R.K. 2002. Blueberry production in the home garden. Univ. of Ark. Coop. Ext. Ser. Fact Sheet 6104. 4 pp.

10. Studebaker, G., D. Johnson, P. Fenn, S.R. Vann, J. Boyd, J. Clark, C. Rom, and R.K. Striegler. 2003. Midwest Commercial Small Fruit and Grape Spray Guide 2003. Univ. of Ark. Coop. Ext. Ser., Little Rock, AR. 75 pp.

11. University of Arkansas Cooperative Extension Service. 2003. Insecticide Recommendations for Arkansas. Univ. of Ark. Coop. Ext. Ser. Misc. Publication 144. 216 pp.

12. Vann, S. and P. Fenn. 2003. Small Fruit Diseases, p. 11-14, In: R. Cartwright (ed.). Arkansas Plant Disease Control Products Guide - 2003. Univ. of Ark. Coop. Ext. Ser. Misc. Publication 154.