11-1-1985

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Bulletin 941

November 1985

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Establishment and Maintenance of Rabbiteye Blueberries

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Published by
Mississippi Agricultural and Forestry Experiment Station
in cooperation with
Mississippi Cooperative Extension Service
and
U.S. Department of Agriculture, Agricultural Research Service

Establishment and Maintenance of Rabbiteye Blueberries

Establishing a blueberry plantation without careful planning is an exercise of poor judgment. Some of the more important considerations in preplanning are in the form of questions as follow:

1. Do I have an acceptable site?
2. What use do I plan to make of the berries? (the answer is important to selection of the proper varieties.)
3. Where can I get plants of the varieties I choose to grow?
4. Am I capable of handling the harvest?

These and other questions are addressed in this bulletin.

Establishment

Site Selection and Preparation

Rabbiteye blueberries grow well on many soil types but do best on light, well-drained soils with pH of 4.2 to 5.5. Low areas with a high water table are not recommended but can be used if the water table is 20 inches or more below the soil surface. A drainage system is recommended for sites with a water table less than 20 inches below the soil surface.

Have the soil tested and adjust pH to within the required range. Apply and incorporate elemental sulfur to increase acidity (lower pH) if pH is above 5.5. Apply and incorporate dolomitic or calcitic lime to decrease acidity (raise pH) if pH is below 4.2.

Do not burn windrows on newly cleared areas because the ash can raise pH above that of unburned areas on the site. If windrows have been burned, sample such areas separately and apply sulfur as indicated by soil-test results.

Note: If sulfur is required apply and incorporate it at least 6 months before setting plants.

Determine row direction and make a plat of the site (Figure 1). If the slope mandates contouring, seek assistance from the Soil Conservation Service. Plan for plant spacing of 6 to 8 feet on rows spaced 12 to 14 feet apart. The closer spacing permits more efficient mechanical harvesting, and the wider spacing often is used in pick-your-own operations. The 6 x 12 spacing gives 605 plants per acre; the 8 x 14 spacing, 389 plants per acre.

Prepare the site at least one season before planting. Subsoil to improve drainage and root penetration of soils with pans. A cover crop, such as millet, can be planted in early summer and incorporated into the soil in the fall. This can be followed with a winter crop, such as rye, if you plan to set plants in the spring.

Eradicate weeds the year before planting. This usually requires extensive cultivation and/or the use of a systemic herbicide for control of brambles, grasses with rhizomes and other hard-to-kill weeds.

Determine the varieties to be planted, select a source of plants and arrange to have them available at the expected time of planting.

The market to which the fruit will be sold bears importantly on the selection of varieties. Growers who plan to market on a local pick-your-own basis need to choose two or more varieties that yield fruit over a long

Table 1. Percent of total yield harvested at various picking intervals, 4-year average of 12 rabbiteye blueberries planted in 1979 at Poplarville, Mississippi, by variety and harvest interval.

Variety*	Harvest Intervals 5/20 - 6/15 %	6/16 - 7/8 %	7/9 or later %	Total Yield 1984 lb/plant
Aliceblue (E)	15	67	18	14.8
Beckyblue (E)	55	44	1	7.0
Bluebelle (M)	2	71	27	6.9
Briteblue (M)	12	69	19	11.0
Centurion (ML)	1	61	38	10.4
Climax (E)	47	46	7	9.5
Delite (ML)	5	82	13	5.3
Powderblue (ML)	16	66	18	9.9
Premier (E)	62	34	4	15.3
Southland (ML)	14	67	19	12.6
Tifblue (ML)	13	76	11	13.6
Woodard (E)	26	65	9	10.5

*Maturity: (E) Early, (M) Midseason, (ML) Mid- to late season.

Table 2. Fruit yields of 14 rabbiteye blueberry varieties planted in 1979 at Poplarville, Mississippi, by variety and year.

Variety*	Total Yield (lb/A) 1981	1982	1983	1984	1985
Aliceblue (E)	1,338	3,963	4,644	8,900	9,511
Beckyblue (E)	1,327	1,773	1,643	4,140	7,411
Bluebelle (M)	944	1,052	1,542	4,126	4,844
Briteblue (M)	887	3,902	3,510	6,616	9,849
Centurion (ML)	1,111	2,622	3,338	6,240	9,142
Climax (E)	804	1,164	3,513	5,717	8,543
Delite (ML)	406	1,662	2,111	3,168	4,163
Homebell (ML)	668	2,115	2,822	7,566	8,917
Menditoo (ML)	3,334	1,980	2,174	5,582	4,870
Powderblue (ML)	196	2,574	3,159	6,600	7,460
Premier (E)	647	2,435	3,200	9,184	8,620
Southland (ML)	1,024	2,920	3,462	7,581	9,909
Tifblue (ML)	48	2,348	3,213	8,190	10,744
Woodard (E)	871	2,486	3,794	6,305	8,207

*Maturity: (E) Early, (M) Midseason, (ML) Mid- to late season.

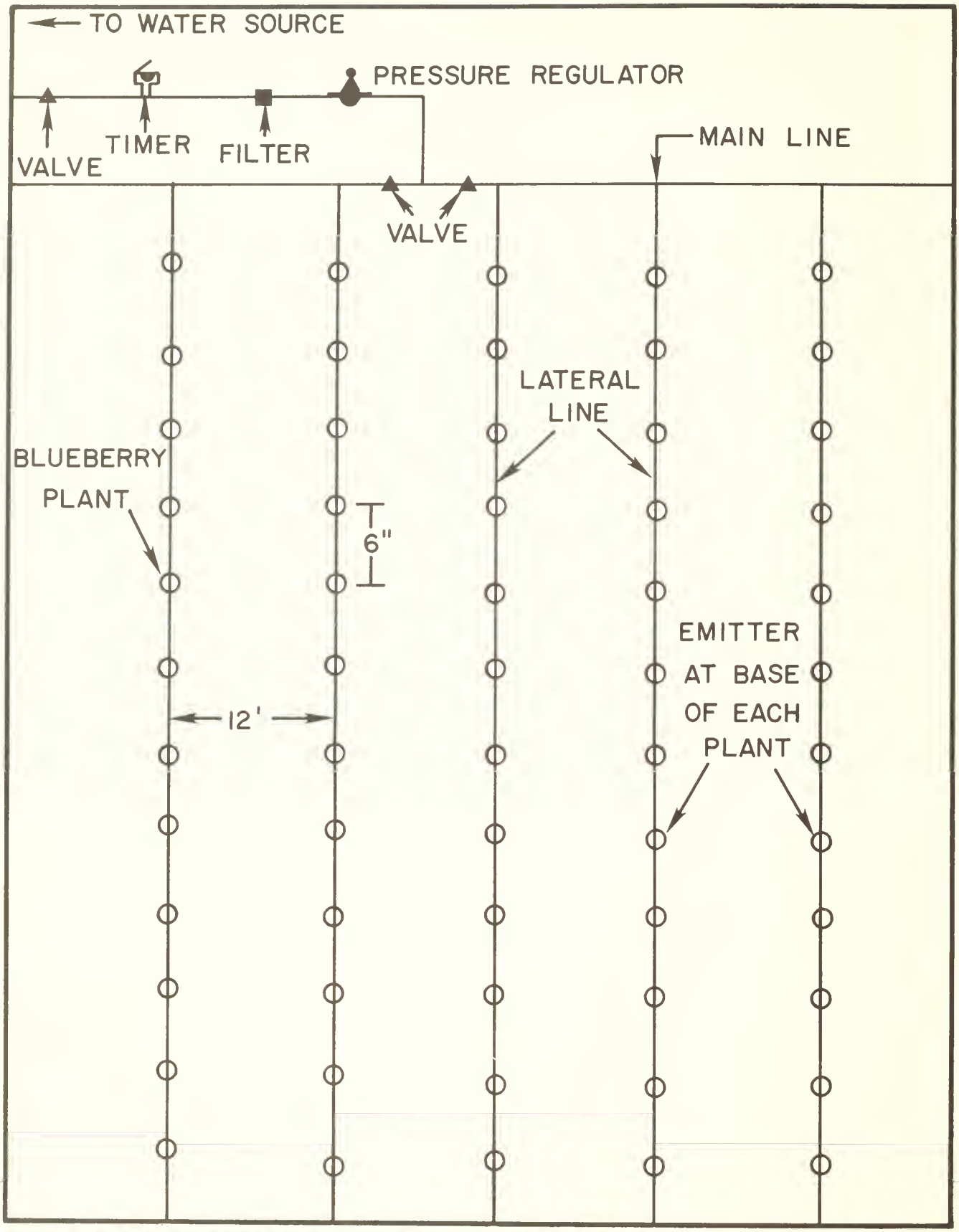

Figure 1. Plat of a trickle-irrigated blueberry plantation with plants 6 feet apart in rows spaced 12 feet apart.

Figure 2. Blueberry planting sites can be prepared using a middle-buster (left) to open rows or by digging a hole with a tractor mounted auger (right).

season (Tables 1 and 2). Those who plan to market through wholesale channels need to choose two or more varieties with peak ripening in early to midseason. (see Characteristics of Available Varieties, Appendix, Page 10.)

Irrigation

Select the irrigation system to be used and have it ready for operation before the newly set plants start to bud (Figure 1).

Setting Plants[1,2]

Plant at any time during the dormant season, usually from early December to early March.

Planting site preparation can be done in two ways: (1) by opening the rows with a middle-buster, placing the peat where the plant is to be set, mixing it into the soil with a rototiller and bedding back over the middlebuster furrow, or (2) by digging a hole about 2 feet in diameter and 2 feet deep with a soil auger (or shovel) and filling the hole with a mixture of peat and soil (Figure 2).

Caution: Wet the peat thoroughly before mixing with the soil or wet the peat-soil mixture thoroughly before setting plants.

Disturb the root mass of container-grown plants (Figure 3). Root pruning of bare-rooted plants is not necessary.

Prune plants to a height of 6 to 8 inches before planting. Set them ½ to 1 inch deeper than they were grown in the nursery.

Management

Fertilization

Rabbiteye blueberry plants are highly sensitive to readily soluble fertilizers, and excessive amounts can cause plant injury or death. *Never* fertilize in excess of soil-test recommend

Figure 3. Before planting container-grown plants, break up the root mass with a knife, hatchet, or other cutting tool. This is not necessary with bare-rooted plants.

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[1]*Check with the County Agricultural Agent or Cooperative Extension Service Specialist for reliable plant sources.*

[2]*Two-year - old bare-rooted or container-grown plants are preferred. Use healthy plants of named varieties.*

ed rates. *Never* concentrate fertilizer in a small area around plants. Do not apply nitrate forms of nitrogen. (*Note*: Ammonium nitrate can be used but other sources of nitrogen, such as ammonium sulfate, are preferable.)

First Year–Blueberries planted under irrigation in fertile soil with incorporated peat moss usually require no fertilization in the first growing season. However, growth of young plants sometimes can be increased by application of small amounts (1 ounce per plant in May and again in June) of a complete acid-forming fertilizer that contains nitrogen in the ammonium form (e.g., 14-4-8 or 14-8-8).

Second Year to Maturity–Apply the 14-4-8 or 14-8-8 complete acid-forming fertilizer in the second year at 2 ounces per plant in March and again in June. This amount can be increased in 2-ounce increments each year until the rate reaches 8 ounces per plant (see Fertilization, Appendix, Page 8). These rates have been proven adequate for blueberries with an adequate supply of soil moisture, and higher rates can be damaging (Figure 4). For example, the problem of plants with pale green or yellow leaves (chlorosis) and low vigor most likely is too much fertilizer and too little water.

The appearance of chlorotic plants of low vigor in adequately fertilized and irrigated orchards may indicate iron or magnesium deficiency. Deficiencies of these elements can be corrected by applying iron chelate or magnesium sulfate (epsom salts). (*Note*: Seek assistance from the County Agricultural Agent or Cooperative Extension Service Specialist if these symptoms appear.)

Irrigation

A dependable irrigation system is essential for successful establishment and growth of rabbiteye blueberries in the Gulf States region (Figure 1).

Irrigation in the first 2 years speeds establishment of uniform and healthy plants, and a small first crop from all plants in irrigated orchards normally is expected in the second year. Establishment of vigorous and productive plants without irrigation may require 3 or more years.

Irrigation of bearing orchards usually is most critical from the beginning of fruit set until harvest. Irrigation at this time increases fruit production, improves fruit quality and promotes growth of fruiting wood for the next year's crop.

Figure 4. Plants grown with low irrigation and low fertilizer application (left) and with low irrigation, high fertilizer (right).

Weed Control

Eradicating weeds the year before planting is vital to the success of establishing and growing weed-free rabbiteye blueberries–it minimizes the need for weed control in the first year of growth, and recommended herbicides can be applied safely in subsequent years.

One of two or more systems of management (depending upon soil type and topography) can be used for established plants.

Maintaining sod strips between weed-free rows (Figure 5) is recommended where erosion is likely. Sod strips also permit movement of equipment in wet periods. Other advantages are convenience to workers, pickers or pick-your-own customers. Sod strips can be seeded to grasses, or the natural vegetation can be left. In either event, the sod-strip cover should be of a type that offers little competition with the blueberry plants and is easily controlled. Clip the sod strips as needed to keep weeds from seeding.

Clean cultivation can be used in orchards where erosion is not a problem. Planting a winter annual in the row middles and disking it under in early spring is recommended. Disk the row middles periodically to keep weeds from seeding.

Use herbicides or shallow cultivation to maintain weed-free rows in each system. Several herbicides are labeled for use with blueberries. The County Agricultural Extension Agent or Cooperative Extension Specialist can assist with specific weed-control recommendations.

Mulching

Mulching with organic materials (such as bark, straw, or leaves) conserves moisture and gives some suppression of weeds. The economic feasibility of mulching commercial plantings is questionable, but

Figure 5. Sod strips in a young blueberry planting (left) and a mature planting (right).

mulching is highly recommended for home growers and growers with small numbers of plants.

Disease Control

Diseases seldom are a serious problem in rabbiteye blueberries. Rabbiteye blueberries are more resistant to fungal infections than are highbush blueberries.

Root rot can cause problems, especially in wet, poorly drained soils. Stem blotch is characterized by red blotches on the previous season's growth, and anthracnose can cause stem dieback on more susceptible varieties.

These and other reported diseases are found only in isolated situations and are not considered serious problems at present. There is no disease spray program for rabbiteye blueberries.

Insect Control

Rabbiteye blueberries are more resistant to insect damage than are highbush varieties. Relatively few insect species attack the rabbiteye varieties and, as with diseases, damage occurs in only isolated cases.

Insects known to attack rabbiteye blueberries include stem borers, cranberry fruit worm, leaf rollers, mites, bagworm, orange-striped oak worm, yellow-necked caterpillars and scales. Fire ants are a major problem during harvest and should be eliminated.

An insecticide spray program is not necessary because insect infestations are infrequent. However, you should monitor your orchard and spray with an approved insecticide if infestation is detected.

Pollination

Planting of two or more varieties is required for cross pollination to enhance fruit set, earlier ripening and larger fruit. The blooming interval of most available varieties overlaps sufficiently to assure adequate cross pollination. (see Pollination, Appendix, Page 9 for two planting-pattern designs.)

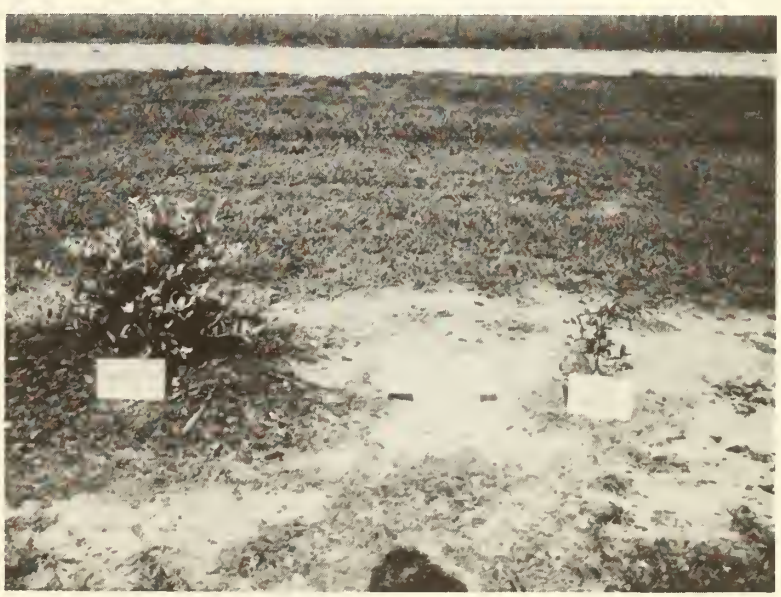

Figure 6. Significant differences are apparent between the unirrigated mulched plant (left) and the unirrigated and unmulched plant at right.

Bees are needed for pollination. Wild bees often are present in sufficient numbers to assure cross pollination in small plantings. Domestic honey bees (about one to two hives per acre) should be provided for large plantings and in areas with small populations of wild bees.

Pruning

Cut plants back to a height of 6 to 8 inches before planting. Remove all weak shoots and fruit buds. Additional pruning usually is not needed in the year of establishment.

Pruning in the second through fifth years consists mainly of removing the lower twiggy growth, dead or damaged shoots and weaker growth. In the post-harvest season, remove the top one-third of tall shoots to encourage lateral branching and prevent excessive drooping in the next fruiting season. Shape plants for mechanical harvesting by removing all shoots growing outside a 12-inch band within the row.

Prune mature plants immediately after harvest. This permits shoot regrowth and flower bud formation before plants become dormant (Figure 7).

When plants become too tall to harvest easily, summer prune immediately after harvest to reduce top height by selective removal of about one third of the older canes. This permits better light penetration into the center of the plant.

Harvesting

Harvesting begins in late May in Florida and continues into August in North Carolina. The Mississippi harvest normally runs from early June to late July.

Picking of most varieties should begin one to two weeks after the first blue color appears or three to six days after the fruit is completely blue. Berries harvested too early are smaller, are of poorer quality and contain less sugar.

Most rabbiteye plantings are of 10 or less acres, and the crop usually is harvested for fresh market or by pick-your-own customers. Berries should be hand picked at about one-to two-week intervals, depending on rate of ripening.

Mature rabbiteye plants normally produce 20 pints or more per bush, and four to six pickers are required for harvesting one acre. Fruit damage is reduced by picking directly into the containers in which the fruit will be sold on the fresh market. Careful grading by the picker is required if this method is used. Early morning picking is recommended, and immediate placement in coolers or in a shaded area is essential for maintenance of top quality.

Two types of mechanical harvesting aids are available–a hand-held

Figure 7. Drawings show plant before pruning (left) and after pruning (right).

haker and an over-the-row harvester Figure 8). Both types remove some wigs, leaves and undesirable fruit; herefore, cleaning is necessary. Cleaning usually is accomplished with a blower unit that removes most eaves, small twigs and small immature berries and a conveyor belt to facilitate removal of the remaining undesirable fruit and foreign matter which may be present.

Shelf life of machine-harvested berries is shorter than that of those that are hand picked and should not be moved into fresh-market channels unless it can be made available to consumers without delay. Much of the mechanically harvested fruit is frozen, dried or used in pies, pastries and other prepared foods.

Note: See MAFES Research Report Vol. 8, No. 8 for information on cost comparisons for hand and mechanical harvesting.

Figure 8. Harvesting with a hand-held shaker (left) and over-the-row harvester (above).

Appendix

Fertilization

Finding a complete acid-forming fertilizer is difficult because most commercially available complete fertilizers have a lime-containing filler. Workers at the USDA Small Fruits Laboratory at Poplarville, Mississippi have developed a good blueberry fertilizer (14-8-8 analysis). The nitrogen sources are ammonium sulfate and diammonium phosphate, and the filler is cottonseed meal. Contact the County Agricultural Agent or Cooperative Extension Service Specialist for sources.

General recommendations for using this formulation on most plantings are shown in the following table:

Years Plants have been in field	Recommended rates*
2	400 lb/acre** 2.5 oz/plant***
3	680 lb/acre 4 oz/plant
4-5	1,020 lb/acre 6 oz/plant
6 or more	1,361 lb/acre 8 oz/plant

* Recommended rate should be applied as split applications, one-half in March and one-half in June.

** Fertilizer broadcast evenly over the entire acreage supplies nutrients equally to plants and sod and will help maintain uniform pH and fertility over the entire area.

*** Applied to a 16 sq ft area beneath each plant and is only 22% of the per acre recommendation. Spread the recommended amount equally over the 16 sq ft area.

Irrigation

Blueberry plants require from 1 to 2 inches of water per week in the first year or two of growth. Upland soils in the Gulf States region are well drained but have low water-holding capacity. Short periods (1-3 weeks) without rain can stress blueberry plants severely. Irrigation during such periods is required for optimum plant performance.

The rapid decrease in soil moisture during dry periods increases the concentration of fertilizer nutrients in the soil solution, which may damage plants. Irrigation lowers the concentration of nutrients in the soil solution, and this reduces the risk of fertilizer damage.

Trickle irrigation–This is the most efficient method but requires a filtering system for muddy water from ponds or lakes. Excellent results have been attained with two in-line swimming pool sand filters. Water from most wells can be filtered inexpensively unless it has high iron content.

The trickle irrigation system operates on low water pressure and consists of polyethylene tubing laid down the row (buried or on top of the ground) with an emitter placed above ground beneath each plant (Figure 9). A calculated amount of water is discharged on the soil surface beneath each plant. The recommended rate is 2 to 8 gallons per plant per week, which may be in split applications. Water requirements increase as plants increase in age and size.

This system operates under low pressure and requires less water for a given area, thereby increasing efficiency of the pump.

Flood (furrow) irrigation–The orchard must be on land with a slope that permits water to flow freely from the high to the low end of the orchard.

Sprinkle (overhead) irrigation–This type of irrigation requires high operating pressure to distribute large volumes of water. Another disadvantage is wetting of foliage, which can create and/or compound disease pro-

Figure 9. Trickle irrigation.

blems. Advantages are that it may be used for frost control and activation of herbicides.

Pollination

Planting the same variety on a row is advantageous for ease of harvesting. Irrespective of the number of varieties in an orchard, always plant each variety adjacent to a different variety to provide cross pollination. Two designs of a six-row planting of two varieties are diagrammed below:

½ variety A
½ variety B

A
B
B
A
A
B

⅔ variety A
⅓ variety B

A
B
A
A
B
A

Propagation

Rabbiteye blueberries usually are propagated from softwood or hardwood cuttings selected from healthy, disease-free mother plants. Cuttings are placed in a propagation bed in a medium that holds moisture well but allows adequate aeration. Water is delivered with an intermittent mist-watering system (Figure 10).

Softwood Cuttings–Softwood cuttings (4-5 inches long) are taken in late spring from the tips of the current season's growth. These should be collected when stems are still somewhat flexible and terminal leaves are half-grown to almost mature (Figure 11). Cuttings taken too early (terminal leaves very succulent, stems very flexible) wilt readily. If cuttings are taken too late (mature leaves, second flush of growth initiated), poor rooting will occur. Rooting usually is more successful when cuttings are obtained from the first flush of spring growth. However, cuttings can be collected from growth flushes occurring later in the growing season.

Take cuttings from the upper part of the mother plant. Use sharp, clean pruning shears or knives disinfected in solution of 1 part household bleach:5 parts water. Disinfect tools between mother plants. Remove lower leaves by pulling them upward to avoid tearing of bark, leaving the two or three terminal leaves. Don't allow cuttings to dry; keep them moist and cool after collection. Place cuttings in propagation bed as soon as possible at a depth of one-half to two-thirds of their length (Figure 10). Cuttings are usually planted at a 2-inch by 2-inch spacing. Pre-punching holes in media is often advantageous. Firm media around the base of cuttings to avoid air pockets.

Hardwood Cuttings–Hardwood cuttings are taken

Figure 10. Softwood cuttings properly set in a propagation bed with mister off (above) and on (below).

Figure 11. Softwood cuttings: left, too young and succulent; center, proper stage of growth; right, too old.

Figure 12. Hardwood cuttings.

during the dormant season after sufficient chilling has occurred, usually late January through February. Strong, healthy shoots or "whips" (usually 12-36 inches long) that grew the previous summer are collected. These "whips" are divided into sections 5 to 6 inches long (Figure 12) with a sharp knife or a bench saw with a fine blade. If the terminal of the shoot contains flower buds, remove the flower buds or discard the tip.

The same beds and media used for softwood propagation can be used for hardwood cuttings. Cuttings are inserted into the medium from one-half to two-thirds of their length. The medium should be pressed firmly around the base of cuttings which are usually spaced 2 inches by 2 inches. Propagation beds must be kept moist, but care must be taken to avoid using too much water. Hardwood cuttings can be watered with a sprinkler until they leaf out, then mist watered while in leaf but not yet rooted.

After cuttings are rooted, a weak complete liquid fertilizer can be applied weekly. Plants can remain in the propagation bed until winter (use little or no fertilizer in this case) when they should be transplanted into pots or nursery beds and held for one year. If plants are strongly rooted by June or July, they can be transplanted to pots, placed under shade, and fertilized with a slow-release complete fertilizer 2 weeks after transplanting. This method often results in plants large enough for field planting in the next winter.

Propagation beds need to be well-drained, under shade cloth (40-70% shade), and have adequate ventilation. Avoid excessive wind movement that may interfere with mist control.

Propagation Media—A medium that retains moisture well but allows aeration is necessary. Media containing various propagation mixtures of coarse sand, ground pine bark, perlite, sawdust, and peat moss have proven satisfactory. Root development is best when the rooting medium contains at least 25-50% peat moss. Mixtures of coarse sand, ground pine bark, and peat moss (1:1:1), or perlite and peat moss (1:1) often are used.

Mist System—The mist system should keep the media uniformly moist but not soggy. If you can squeeze out only a few drops of water from a handful of media, you probably have the correct amount of moisture. An intermittent-mist water system is needed to keep the humidity around the cutting near 100%, prevent wilting, and keep the medium moist. Starting with a porous medium that holds moisture well, adjust the mist system to maintain turgid (non-wilted) leaves and high humidity. Frequent (2-10 minutes) short misting intervals (2-10 seconds) are recommended.

Characteristics of Available Varieties*

Early Season

Climax—upright, open plants. Berries are medium in size, medium dark blue in color, have a small scar and good flavor. Early season, ripening three to five days before Woodard. Concentrated ripening, excellent for machine-harvest. Georgia 1976.

Woodard—early, seven to ten days before Tifblue. Bush size shortest and most spreading of Georgia varieties. Produces many suckers. Berries are light blue,

*The ripening seasons described herein are generalizations for the Gulf States region and may differ among locations in the region. For example, Aliceblue is listed herein as early season, but its ripening peak at Poplarville, Miss. is in mid-season (see Table 1).

irm, large, with excellent quality when fully ripe but ery tart until ripe. Georgia 1960.

Brightwell—early, same season as Woodard. Berries re medium in size and in blue color, with small dry scars nd good flavor. Plant growth is vigorous, upright and roduces enough new canes to renew the plant. Georgia 981.

Premier—earlier (two to three weeks) than Tifblue. arge fruit with good flavor. Vigorous, disease resistant, roductive. North Carolina 1978.

Beckyblue—early ripening. has a low chilling requirement. Extends the cultural range of rabbiteye blueberries into South-Central Florida. Interplant with Aliceblue. Not recommended north of North Florida. Florida 1978.

Aliceblue—early ripening with low chilling requirement. Similar to and should be interplanted with Beckyblue. Florida 1978.

Mid-season

Briteblue—bush moderately vigorous, grows upright and open. Mid-season, generally before Tifblue. Berry firmness, heavy bloom, and small dry scar combine to make this a good shipper. Fruit with good flavor when fully ripe. Georgia 1969.

Bluebelle—excellent pick-your-own cultivar. Berries large, round, light blue with excellent flavor that size well throughout the season. Mid-season. Plants moderately vigorous with upright growth. Scar tends to tear, not recommended for shipping. Georgia 1976.

Mid-to-late Season

Tifblue—leading rabbiteye variety. Bush very vigorous and widely adapted. Mid-to-late season. Fruit large, round, light blue, sweet, very firm with small dry scar. Berries appear to be ripe several days before full flavor develops. Berries remain on plant several days after fully ripe. Georgia 1955.

Delite—upright bush. Moderately vigorous. Season slightly later than Tifblue. Berries are light blue, often with reddish undercoat; large, firm with excellent flavor. Berries are not tart before reaching maturity. Georgia 1969.

Southland—moderately vigorous, dense upright plant. Berries are light blue, medium large with good flavor. Tend to lose size as season progresses. Same season as Tifblue. Scar small and dry. Georgia 1969.

Powderblue—vigorous, disease resistant, productive. Same season as Tifblue with better fruit color and more foliage disease resistance. North Carolina 1978.

Centurion—later than Tifblue. Adds one or more weeks to the rabbiteye ripening season in North Carolina. Good flavor, not as firm and darker than Tifblue. North Carolina 1978.

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