

Blueberry Propagation Suggestions

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Blueberries can be propagated by a variety of methods such as softwood cuttings, hardwood cuttings, suckers and tissue culture. Most small or new growers purchase their plants from a nursery, but once a field is established, on-farm propagation becomes feasible. Cuttings (softwood or hardwood) are the most commonly used method.

Important considerations

One of the major problems with collecting propagation wood from other grower's fields is contamination of cutting wood, either with off-type cultivars or with diseases. Many farms have a small percentage of off-type cultivars mixed with their primary cultivars. This can create serious problems at harvest time if the off-type ripens at a different time than the primary cultivar. The off-type cultivar may also be of lower quality than the primary cultivar, and thus lower the grade of the packed fruit. When available, always purchase virus-tested, true-to-type plants to serve as propagation sources.

Diseases such as viruses may be transmitted via cutting wood taken from infected bushes. Although distribution of blueberry viruses appears to be limited at this time in the Southeastern US, avoid propagation from plants that have odd-looking or stunted foliage. They may be harboring a virus that could reduce yields. The Blueberry Stunt phytoplasma is common in NC, and can be transmitted via propagation. Stem Canker is a fungal disease causing swollen cankers that eventually kill infected canes. Avoid collecting cutting wood from infected plants.

Avoiding off-type or diseased cuttings during propagation is best accomplished by scouting the source field during the growing season prior to taking cuttings. Specific rows or individual bushes of uniform, healthy source plants can be most easily found and mapped during bloom and harvest, excluding visibly diseased or off-type bushes. This pre-propagation scouting is especially necessary when growers are planning to take dormant, hardwood cuttings, since off-type or diseased bushes may not be easily identifiable in winter. Once your own field is established, you will be able to identify and remove off-type bushes over time and avoid contamination of your propagation material.

A final consideration is propagating plants legally. In recent years, most of the universities have started patenting their new cultivars to generate money to support the blueberry breeding programs.

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What cultivars are patented?

All of the University of Florida cultivars released since the early 1990's have been patented. A license fee of \$100 per cultivar plus \$.20 for each plant is charged. Contact the Florida Seed Foundation at 850-594-1068 for details. All University of Georgia releases except the newest, 'Alapaha' and 'Ochlockonee', are not patented. 'Austin', 'Brightwell', etc. can be propagated at no cost. For information on 'Alapaha' and 'Ochlockonee' contact the Georgia Seed Development Commission at 706-542-5640. Older NCSU releases such as 'Premier', 'Powderblue', and 'Reveille' can be propagated at no cost. Newer cultivars such as 'Montgomery', 'Ira', 'Columbus', etc. are being assigned to certain nurseries for initial propagation. Contact Dr. Jim Ballington at 919-515-1214 for information.

Sanitation, Water Quality and Drainage

Sanitation in the nursery is extremely important for good rooting of the cuttings and plant survival. The primary problems are death of cuttings during the rooting process from contaminated rooting media (caused by *Cylindrocladium* and other fungi) and infection of rooted plants with *Phytophthora* root rot. If recycled pots are used, they should be soaked in a 10% chlorine bleach solution (9 parts water to 1 part household bleach). Never use recycled media for rooting. Use fresh clean media each time. *Phytophthora* root rot is caused by a fungus with a swimming spore that can be a serious problem on southern highbush blueberries. Avoid saturated conditions in the media during propagation. Growing one gallon plants on gravel beds in the nursery may also help avoid *Phytophthora*. When a propagation facility is used for the second year and after, clean up all debris and spray the area with a 10% chlorine bleach solution before sticking cuttings. *Phytophthora* can survive in pond water, and by this means can re-infect rooting beds or pots irrigated from ponds. For this reason, well water is recommended for all propagation.

Well water testing is recommended to make sure your water is suitable for plant propagation. In North Carolina, the Agronomic Division of the NC Department of Agriculture and Consumer Services charges \$4.00/sample. Water from deep wells in some North Carolina coastal counties may have high levels of sodium from saltwater infiltration, and this has caused total losses in some large cutting beds where the water was not tested beforehand.

If softwood cuttings defoliate before rooting occurs, results will be poor. Take cuttings only from the healthiest plants available and avoid taking cuttings with leaf spots, if possible. After sticking the cuttings, spray them several times two weeks apart with a dilute foliar fungicide appropriate for the leaf diseases present. See your county agent for identification of the leaf diseases present and recommended treatment.

In 2001 many outdoor softwood propagators in Georgia reported lower rooting percentages than normal. Apparently, the heavy rains in June during the rooting process created conditions ideal for fungi to attack the cuttings. Use of a greenhouse-type structure that keeps the rain off the propagation beds would probably have been beneficial in 2001. However, normally, good results can be obtained in rooting softwood cuttings without a greenhouse. In North Carolina, overwatering and lack of adequate drainage are the most common causes of propagation failure. Even in the absence of disease, cuttings will quickly die in waterlogged rooting beds. Provision must be made for adequate drainage prior to sticking cuttings in the rooting bed.

Softwood Propagation

Softwood propagation has been the method of choice for propagating rabbiteye and southern highbush blueberries in Georgia. Large numbers of cuttings can be taken at the same time and rooting percentages can be high (70-80% is common). In North Carolina, the use of softwood has replaced much of the traditional hardwood propagation because softwood propagated plants are more likely to be free of stem canker, and can be rooted much more quickly (6-8 weeks as opposed to 6 months for hardwood).

Mist propagation system: Softwood propagation requires a mist propagation system or similar set-up, but once constructed it will last for many years. To prevent cuttings from wilting, a mist system is used keep a film of water on the leaves during the day. This system consists of a day/night timer, mist timer (10 min. clock), solenoid valve, water filter, and mist nozzles suspended about the cuttings. The mist is applied in short intervals (5 to 10 seconds) every 2 to 10 minutes, only long enough to keep a thin film of water on the leaf surface. The system is usually turned off at night. Use care to avoid waterlogging the rooting media; mist timing requirements vary through the season. A typical setting in a shady bed is five seconds every 10 minutes, but this will need to be adjusted for each situation. A better system uses a micro-leaf mist controller (Mist-O-Matic™, etc.). This is a piece of screen wire on a swing arm that turns on the solenoid for a few seconds each time the screen wire starts to dry. However, spiders are prone to build webs inside this device and cut off the flow of water, killing the cuttings. With either system it is highly recommended that the system be checked several times a day.

Some growers in Georgia have had good results using impact sprinklers and shrub watering heads to keep the cuttings wet in place of mist nozzles (in North Carolina, this is the traditional method for watering hardwood beds). Some growers are even rooting cuttings with this system in full sun. However, if the system fails, the cuttings will rapidly dry out and die if no roots have developed. The advantage of this system is low cost and no requirement for a propagation structure since the droplet size produced by impact sprinklers and shrub watering heads is much larger than the droplet size produced by a mist system.

Propagation house: A propagation house is usually constructed to house the mist system. Normally it has a plastic skirt about four feet in height, to serve as a wind break and a top six to eight feet above the cuttings covered with 40 to 63% shade cloth. In the event of breakdown of the mist system, the shade cloth prevents rapid death of the cuttings. Some growers forgo the shade cloth top and use the filtered light of pine trees overhead to provide shade. A more advanced system uses a greenhouse to house the mist propagation system. The floor of the propagation house must be very well drained. A layer of coarse sand covered with landscape fabric to control weeds is often used. If the rooting containers are placed on the floor of the house, a bed of gravel can be laid over the landscape fabric to improve drainage, if needed. Slats or spacers can also be used to keep the containers off the landscape fabric if drainage needs improvement. Benches of various heights made of treated wood with wire tops are often used to keep the containers off the ground and reduce disease problems. See your county agent for detailed information on construction of mist propagation systems and propagation houses. Ornamental nurseries use the same system.

Rooting media and containers: Many different rooting media have been used for propagation of

blueberries including sand, peat moss, perlite, pine bark or various combinations of these. It is important that the rooting media be porous and well drained. It should also be acid, especially if alkaline well water will be used for propagation. Most of the deep well water in South Georgia has a pH of 7.2-7.8 (slightly alkaline). Mixtures of coarse sand, milled pine bark, and peat moss (1:1:1), peat and perlite (1:1), milled pine bark and perlite (1:1), milled pine bark, peat moss, and sand (8:1:1) and milled pine bark alone have all worked well. Mixtures which contain 50% peat moss produce extensive root systems, but media drainage must be carefully monitored. The most common propagation media currently used in Georgia is milled, composted pine bark, since it is low cost and widely available.

In North Carolina, large softwood propagation beds (8-10 inches high, 3-4 ft wide and 50 ft or more in length) are constructed using treated 2 x 8 or 2 x 10 lumber. The entire bed is built atop a 12-18 inch deep layer of coarse sand, and the rooting media is placed in direct contact with the sand to improve drainage. Contact of the rooting media with an underlying sand layer wicks away excess moisture and prevents saturation that would otherwise drown cuttings. Beds are filled with coarse, aged pine sawdust (30-40 years old) salvaged from huge piles left behind at old abandoned sawmill sites. Once common throughout coastal NC, such piles of “dust” have provided a free source of excellent propagation media for many years, but are now growing scarce.

Propagation can be conducted in many types of containers. Often a saturated zone occurs in the bottom of a container. If the container is too shallow, the bottom of cutting will be sitting in this saturated zone. This often results in poor rooting and the development of disease. Since most softwood cuttings are about five to six inches in length and stuck half-way in the media, the containers should be at least 4 ½ to five inches in depth to avoid placing the ends in the saturated zone. Flats with deep cells, one gallon nursery containers, two gallon nursery containers and blueberry picking lugs can be used. Growing plants in large beds is not recommended in Georgia. When disease strikes the cuttings, it may sweep through a large section of the bed. When disease strikes the plants in a one or two gallon container, it is not great loss just to discard the entire container.

Selection of softwood cuttings: Blueberry growth occurs in flushes. Cuttings are taken from the terminal five to six inches when the flush of growth has ceased and the terminal leaves are half-grown to almost mature. The stem should still be somewhat flexible, but mature enough to be pushed into the propagation media without breaking. With low-chilling cultivars in South Georgia, the first window for propagation starts in late April or early May. Higher chilling cultivars should be ready by mid-May. Timing in North Georgia would be two or three weeks later. Cuttings taken from mature wood or second flush growth often do not root as well as first flush growth. In South Georgia, another good period for propagation is early September from the fall flush. The time period for North Georgia would probably be similar to North Carolina, early to mid-August. Most growers wait until August to propagate softwood cuttings in Southeastern North Carolina, since earlier growth flushes occur during harvest when they cannot take time off from picking berries. The cuttings need time to root before the return of cold weather; in North Carolina growers rarely take softwood cuttings later than the first week of September. Outdoor mist systems must be turned off during freezing weather.

Collect the first batch of cuttings early in morning, if possible. It is very important that the

cuttings not be allowed to wilt. This can be prevented by immediately placing them in a bucket of water or a wet burlap sack while taking the cuttings. A vegetable pick sack and misting bottle can also be used. Cuttings should be five to six inches in length, although four inch cuttings can be used if propagation material is in short supply. Take cuttings from the upper part of the mother plant where the wood has a good diameter. Use very sharp by-pass type clippers or florist scissors to take cuttings. Do not use clippers that crush and damage the wood at the base of the cutting. Practiced collectors of cutting wood in North Carolina rapidly gather large numbers of softwood cuttings without using clippers by simply breaking them off by hand. If the tips of cuttings are too succulent, the top of the cutting may be broken or cut off as well.

Preparing the cuttings for sticking: After collecting the cuttings immediately spread them out under the mist system or cool them with ice water. If the cuttings must be transported, place them in an ice chest with slushy ice. If the ice is too cold it will freeze the cuttings it touches, so use sparingly.

Thoroughly wet the propagation media before sticking the cuttings. This can be accomplished by placing the containers and media under the mist several days before cuttings are stuck. Remove one-half the lower leaves from the cuttings, keeping 3 to 4 leaves. If cuttings are held overnight it is a good idea to recut the lower ends just below a node. Hormone treatment is not required for most blueberry cultivars, but may improve rooting and root development on certain cultivars. In Georgia, commercial alcohol-based formulations (such as Dip and Grow™) that are mixed with water are often used. A bundle of 10 to 20 cuttings is dipped into the solution for five seconds before sticking. Stick cuttings one-half their length into the media. Cuttings are usually stuck about two by two inches apart. Firm media around the base of the cuttings to avoid air pockets. North Carolina growers do not use rooting hormones and do not re-cut the lower end of cuttings held overnight.

Rooting phase: Roots should begin developing in about three weeks. This is the time at which the propagator must monitor watering most closely. In a well-drained rooting medium, a large percentage of cuttings will initiate rooting by formation of a mass of callus tissue on the cut end. By comparison, when cuttings are over-watered the mix becomes saturated, cuttings do not form callus, have sparse, watery roots, and begin turning brown from the cut end upwards. This is evidence of poor aeration in the mix. If the saturated area is limited to the bottom of the cutting, roots may form further up on the cutting, leaving a dead segment of stem below the roots. If the medium is saturated throughout and remains so, cuttings will quickly die. Saturation of aged sawdust or bark can be estimated by picking up a handful and squeezing it. By squeezing as hard as you can, you should only be able force out 2-3 drops of water. As the root system develops, reduce the amount of mist the plants receive by cutting back on the hours of operation or adjusting the number of seconds the system is on. Once the plants are well rooted they should be transferred to a sunny area under sprinkler irrigation. Fertilize them lightly with a liquid fertilizer according to the manufacturers recommendation for salt-sensitive plants. Late-summer softwood cuttings stuck in August are generally not fertilized at all.

Cuttings stuck in the spring, are often ready for transplanting by August into grow-out beds or quart pots (if plants will be set in the field the next winter). Since this is a time of great heat, irrigation must be carefully monitored. The cuttings can also be held over the summer in the original rooting containers and only fertilized enough to keep the plants healthy. Transplanting into grow-out beds or gallon pots occurs during the winter. Cuttings rooted in the fall are

transplanted during the winter and are often planted directly into the field rather than potted.

Grow-out phase: Although some growers are planting rooted cuttings in the field or high density pine bark beds, most growers prefer to plant a larger plant. These may be produced in trade-gallon size containers (really three quarts) or in grow out beds without containers. For a container nursery, landscape fabric is laid in a well drained area and an automatic sprinkler system is installed which applies about one-half inch of water per day during the heat of the summer. The availability of self-contained solenoid/time clocks that run off of batteries and screw into a household hose bibcock has made small-scale nursery production much simpler. These can be purchased for about \$30. For container production, a high grade of milled, composted pine bark should be used for a growing substrate. A complete, slow-release fertilizer should be blended with the pine bark according to the manufacturers recommendations. A top dressing of more slow release fertilizer is applied once or twice during the growing season as needed. Slow release fertilizer formulations vary in their longevity.

Grow-out beds are constructed by covering a well-drained area with about six inches of milled, composted pine bark. Over head sprinklers are used for irrigation. The rooted cuttings are set in rows 18 inches apart by 6 to 12 inches in the row. In-row spacing varies with the length of time the plants will be allowed to remain in the grow-out bed. If the plants are scheduled to remain in the bed for a full year an 8 to 12 inch spacing is suggested. Slow-release fertilizers are used to fertilize the grow-out bed based on manufacturers recommendations. Another option is to use premium grade 10-10-10 at the rate of about 150 pounds per acre every four weeks.

Hardwood Propagation

Both rabbiteyes and southern highbush can be propagated from hardwood cuttings, however, results are more erratic than when softwood cuttings are rooted under mist. Another problem is the greater chance of picking up stem blight during propagation. The final limiting factor can be lack of good propagation wood for this system. Strong "whips" with many cuttings at least 1/6 inch in diameter are desirable for hardwood propagation and these can be difficult to obtain in low vigor plantings. Possible advantages to hardwood propagation are shifting the propagation season to a less busy time of the year and production of a medium-size plant suitable for field transplanting with a mechanical transplanter one year after cuttings are taken. Hardwood propagation has been used for decades in North Carolina as a less-intensive propagation system that will still result in a 60-70% stand of cuttings. However, some cultivars like the southern highbush 'Sampson' and rabbiteye 'Columbus' are more difficult to root by this method.

Collecting wood and preparing the cuttings: Collect strong, healthy shoots or "whips" of the previous season's growth that are 18 to 36 inches long, in late January and early February. Use only the lower two-thirds or three-fourths of the whip and discard the tip. Cut each whip into sections four to six inches long. Cuttings can be stored in a refrigerator in plastic bags with moist peat moss or bark if not processed immediately. In North Carolina, large numbers of hardwood cuttings are collected in mid-winter, cut up, tied in bundles of 50 and packed in moist sawdust or bark until spring. If the winter chilling requirement for the cultivar has not been received by the time the cuttings are taken, they should be stored in a refrigerator until the chilling requirement is met. Cuttings should be 1/6 to 5/16th inch in diameter. Larger diameter cuttings are more difficult to root, but once rooted produce a bigger plant. To speed the cutting-up process, the cuttings may be bundled together, then cut into sections using a bench saw with a fine blade. A

better, but more time consuming method is to cut them into sections using a sharp knife. The bottom cut is made at a slant just below a node and the top cut ½ inch above a bud. When handling the cuttings, be sure to keep them oriented in the same direction, as cuttings stuck upside down will not root.

Sticking the cuttings: Cuttings are usually stuck in April, and are left in the rooting beds until the following winter. In North Carolina, cuttings are often stuck in sawdust beds under the shade of pine trees with sprinkler irrigation. However, use of a greenhouse or a poly cold frame with bottom heat may improve rooting. Bottom heat is provided by a heating cable set at 68-73 degrees F buried in the bed. Rooting bed frames typically three by six feet in length with hardware cloth on the bottom are used to contain the media. The same medias and rooting beds used for rooting softwood cuttings can be used for hardwood cuttings. Rooting hormones are normally not needed, but may improve the rooting of some hard-to-root cultivars. Cuttings are stuck on a 1 ½ inch by 1 ½ inch spacing with only one bud exposed.

Rooting phase: Hardwood cuttings normally break bud and develop leaves before rooting. This means there is a critical period where plants are very susceptible to desiccation before root development. Mist systems as described for softwood cuttings, or impact sprinklers are used to keep the leaves wet until root development. In the case of impact sprinklers, hardwood cuttings are watered for 3-4 hours per day, usually in mid-morning and early afternoon. Watering frequency depends on many factors, including the rooting medium used and the degree of shade.

Grow out phase: Hardwood cuttings are normally left in the rooting bed frames for one growing season. After the plants are well rooted they are fertilized periodically with a light dose of liquid fertilizer such as 15-30-4 or 13-36-13. In North Carolina, growers are advised to apply 1 lb. diammonium phosphate (18-46-0) dissolved in 4 gallons water per 100 sq. ft. of bed beginning when cuttings are well-rooted (July 1-15) and repeated every 2 weeks until mid-August. By fall, many of the plants should have a root system about six inches in diameter. The following winter they can be transplanted into one or two gallon containers or transplanted into a grow-out bed. However, often they are transplanted directly into the field.

Suckers

Suckers are blueberry shoots that arise from the ground several inches from the main crown of the plant. Some rabbiteyes like ‘Tifblue’ produce significant numbers of suckers, especially when mulched. After the suckers have been growing for at least two seasons they may be separated from the mother plant with a sharp shovel during the winter. Normally suckers have a large top and a small root system after separation from the mother plant. If the top is not pruned back severely, the plant will usually perform poorly or die. Suckers can be transplanted to a permanent location in the field or lined out in a nursery bed for one season before transplanting to the field.

Sources of information and additional reading

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