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Hints on Growing Blueberries
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Hints on Growing Blueberries

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Introduction

Blueberries require fairly specific soil and climatic conditions for maximum production. The commercial industry is restricted to areas in western Michigan, primarily Allegan, Berrien, Muskegon, Ottawa and Van Buren counties, where the climate and soils are ideal. Smaller patches of blueberries are also grown throughout the southern part of the state. Information in this bulletin is primarily directed towards commercial production but will be helpful also to part-time and backyard growers.

Economic Considerations

Costs of establishing and maintaining a blueberry planting are high, but returns from well managed plantings on suitable sites can be substantial. The common row and plant spacings require between 1,000 and 1,200 plants per acre. Two-year-old blueberry plants cost between \$1 and \$2, so it will cost between \$1,000 and \$2,400 per acre for plants alone.

No crop will be harvested the first two years. Properly managed plantings will yield 400 to 800

lb/acre the third season and 1,400 to 2,000 lb by the fourth year. Full crops of 4,000 to 6,000 lb/acre are generally harvested after six to eight years, although mature plantings can yield in excess of 10,000 lb/acre under optimal conditions. Well maintained blueberry bushes remain productive for at least 15 to 20 years.

Selecting the Site

RANGE IN MICHIGAN:

Though wild lowbush and highbush blueberries grow throughout Michigan, cultivated highbush blueberries generally grow best below a line extending from Muskegon to the lower end of Saginaw Bay. Above this line, the growing season tends to be too short and winter temperatures too cold for highbush blueberries. They require an average growing season of 160 days, and late spring or early fall frosts can damage plants. Mid-winter temperatures of -20 to -25 degrees F, which are not uncommon in northern lower Michigan, can severely injure or kill both flower buds and young branches. Standard highbush

cultivars may be grown successfully in northern lower Michigan only if winter and spring temperatures are moderated by lake effects, or if plants are protected by snow cover.

AVOID "FROST POCKETS":

Even in southern Michigan, late spring frosts can severely damage flowers and reduce yields, particularly in areas outside of the influence of Lake Michigan. Avoid low-lying areas surrounded by woods or hills—these "frost pockets" tend to collect cold air. Higher sites with a gentle slope have greater air circulation and are less prone to spring frost damage. Air movement may also suppress certain fungal diseases and provide more comfortable picking conditions during hot weather.

SOIL REQUIREMENTS:

Blueberries have very specific soil requirements. Blueberries have performed well in Michigan on a number of soil types, including Au-Gres, Au-Gres-Saugatuck, Covert, Houghton, Morocco, Napoleon, Newton, Pipeston-Kingsville and Thetford. All these soil types tend to be acidic and sandy with a varying

organic content.

Organic Matter: The soil should be high in organic matter. Organic matter increases the water-holding capacity and improves the aeration of soils. Blueberries have fibrous, shallow roots that are sensitive to soil compaction and poor drainage. During the growing season, water standing on the surface for one or two days can damage roots. Avoid planting on heavy soils that drain slowly. Soil organic matter can be increased in small plantings by incorporating peat, bark mulch or straw, but this is usually impractical in larger plantings.

Soil Moisture: Ideal soils are well drained with a water table 14 to 22 inches below the surface. These soils provide a constant, moderate water supply through the season but pose few problems with standing water and waterlogging.

Even on the best sites, dry seasons frequently reduce growth and yields. Many Michigan growers now irrigate to avoid drought stress. Both overhead sprinklers and trickle irrigation systems are used. The costs of establishment and potential benefits of irrigation are difficult to compare, but plantings on sandy soils low in organic matter will benefit most from irrigation. Overhead systems provide the added benefit of frost protection, which trickle systems cannot provide.

Soil pH: Blueberries require acid soil with pH below 5.5, and they do best where the pH is between 4.5 and 5.0. Test the soil pH before planting blueberries. (Consult your county Cooperative Extension Service for instructions.)

Variety Selection

Highbush blueberry varieties vary in growth habit, disease resistance, berry characteristics, harvest season and yield potential. Choose varieties suited to your region and intended use. Varieties adapted to Michigan conditions are described in detail in Extension bulletin E-1456, "Highbush Blueberry Varieties for Michigan."

Although highbush blueberry varieties are generally self-fruitful, using two or more varieties that ripen at different times will lengthen the harvest season. A long harvest season may be particularly helpful if you're growing fruit for the pick-your-own market. Harvest season and other important traits of varieties that perform well in Michigan are listed in Table 1.

Northland and Patriot are hardy crosses between highbush varieties and lowbush blueberries. They are "half-high" types that perform well in colder regions where snow cover provides protection during winter. Though the buds and wood of these varieties may tolerate midwinter temperatures as low as -30 degrees F, they have several drawbacks. Patriot blooms very early and is often damaged by spring frosts. Northland requires extensive pruning, and its fruits are small and soft. Several promising half-high cultivars have been recently released by the University of Minnesota, but they have not been extensively tested and cannot be recommended yet for commercial use.

Establishing the Planting

PREPARING THE SOIL:

Test the soil and adjust soil pH to 4.5-5.0 before planting. If the pH is below 4.0, incorporate finely ground dolomitic limestone, following rates recommended on a soil test report (usually 1 to 2 tons per acre).

Table 1. Traits of recommended blueberry varieties.

Trait	Varieties
Early season	Blueray, Bluetta, Spartan, Patriot
Midseason	Bluecrop, Rubel, Northland
Late season	Jersey, Elliot
Mechanical harvesting	Bluecrop, Jersey, Rubel
Pick-your-own	Blueray, Spartan, Bluecrop
Hardy	Blueray, Northland, Patriot

If the pH is above 5.1, acidify the soil with elemental sulfur or aluminum sulfate. It will require 450 to 900 lb sulfur or 2,700 to 5,400 lb aluminum sulfate per acre to lower the pH one unit, e.g., 5.5 to 4.5. Use the higher rate on heavier loam soils high in organic matter and the lower rate on light sandy soils low in organic content. It is usually not economically practical to acidify organic soils with a pH higher than 5.5 or 6.0. If the pH in established plantings is slightly over 5.0, continued use of ammonium sulfate fertilizer will gradually reduce it.

PLANTING:

Obtain plants with a State Certificate of Inspection from a commercial grower or reputable nursery. High quality, disease-free plants establish more readily and live longer than diseased or weak plants. Two- or 3-year-old bare-root or container-grown plants are recommended. Older plants are usually larger and more expensive and may require some pruning to establish quickly. Younger plants are more difficult to manage.

Set plants in the fall or early spring as soon as the soil can be worked. Space plants 4 to 5 feet apart in the row on less fertile mineral soil or 5 to 6 feet apart on organic soil. Rows should be spaced to accommodate equipment, usually 10 to 12 feet apart. Set plants 1 to 2 inches deeper than they were grown in the nursery. Plants may establish more quickly on sandy soil if a

shovel full of acid peat is mixed in each planting hole.

Water Management

Blueberries have a shallow, fibrous root system. Although the costs and returns of irrigating blueberries in Michigan have not been fully studied, most plantings—particularly those on well drained sandy soil—will benefit from irrigation during dry seasons. Drought conditions during fruit development will reduce berry size, and drought stress in August or September may reduce flower bud development and yields the following year. Drought at any time during the growing season adversely affects vegetative growth.

Overhead sprinklers are the most common method of irrigation, but some growers use trickle irrigation systems. Overhead systems provide the added benefit of frost protection.

Apply enough water during each irrigation to moisten the top 12 to 16 inches of soil at a rate slow enough to allow water to drain into the soil without puddling on the surface. Extension bulletin E-1110, "Irrigation Scheduling for Field Crops and Vegetables," provides more detailed information on irrigation scheduling.

Mulches: Mulch materials such as sawdust, bark, wood chips, straw or leaves spread 6 to 8 inches thick under bushes will conserve soil moisture. These may be effective in small plantings but too costly or difficult to

obtain in sufficient quantities for large plantings. Use only weathered sawdust, bark or wood chips—fresh materials may injure plants. Mulched plantings may require two to three times as much nitrogen fertilizer as unmulched plants until the mulch has decomposed.

Fertilizing

The fertilizer program should encourage growth of vigorous shoots, which produce more flower buds and larger fruit. Blueberry soils and fertilizer requirements vary considerably. General recommendations are described here. Consult bulletin E-2011, "Highbush Blueberry Nutrition," for more detailed information, and use soil tests and leaf analyses to modify these recommendations for specific plantings. Extension bulletins E-498, "Sampling Soils for Fertilizer and Lime Recommendations," and E-449, "Leaf Analysis," describe how to collect and submit soil and leaf samples.

FERTILIZING NEW PLANTINGS

Sample the soil a year before planting and adjust the pH to 4.5-5.0 before planting. This will allow adequate time for sulfur to react in the soil. Four weeks after planting, sprinkle about 1 ounce of 20-0-10+5 (N-P-K-Mg) or a similar analysis fertilizer within 12 to 18 inches of each plant, but not directly on the crown or stems.

FERTILIZING

ESTABLISHED PLANTINGS

Nitrogen (N): In most plantings, N is the only element required each year. Amounts required depend on plant age and soil type and are summarized in Table 2. Use urea (45 percent N) if pH is below 5.0 and ammonium sulfate (21 percent N) if pH is above 5.0. Do not apply nitrate forms of N, such as calcium nitrate, or fertilizers containing chloride.

Apply fertilizer in a broad strip on both sides of plants just before budbreak. Use split applications on sandy sites—apply half the rate just before

budbreak and half at petal fall.

Potassium (K): Michigan blueberry soils are rarely deficient in potassium. Apply potassium if the soil test level is below 100 lb K/acre (Table 3) or if leaf analysis indicates a need.

Potassium can be applied as a 2:1:1 complete fertilizer that supplies the recommended amount of nitrogen or as Sul-Po-Mag (22 percent K₂O) or potassium sulfate (50 percent K₂O). Avoid muriate of potash, which contains chloride and can be toxic to blueberries.

Phosphorus (P): A phosphorus deficiency has not been reported

in Michigan blueberries. Use superphosphate (46 percent P₂O₅) before planting to bring the soil test level to 100 lb P/acre if soil analyses indicate a need.

Calcium (Ca): Calcium deficiencies have not been reported. If leaf analysis indicates a shortage and pH is below 4.5, apply 500 to 1,000 lb/acre dolomitic lime.

Magnesium (Mg): Magnesium deficiencies occur occasionally in Michigan blueberries. If soil tests or leaf analyses indicate a Mg shortage, apply magnesium as dolomitic lime at 500 to 1,000 lb/acre if pH is below 4.5, or as magnesium oxide (55 percent Mg), Epsom salts (18 percent Mg) or Sul-Po-Mag (11 percent Mg) if pH is above 4.5.

Micronutrients: Micronutrient deficiencies are uncommon in Michigan blueberries when pH is in the proper range (4.5-5.0).

Pruning

Blueberries require regular pruning to produce high yields of large fruit. Unpruned bushes usually contain a disproportionately high percentage of old canes declining in vigor and fruitfulness and too few young replacement canes. Bushes pruned at irregular intervals produce many small canes that must be thinned. The most fruitful canes are 4 to 6 years old and 1 to 1½ inches in diameter at the base. Bushes should contain about 15 to 20 percent young canes (less than 1 inch diameter) and 15 to 20 percent old canes (2 inches), and 50 to 70 percent

Table 2. Nitrogen requirements for Michigan blueberries.

Age of Planting (years)	lb N per acre*	
	Mineral Soil	Organic Soil
2	15	8
4	30	15
6	45	22
8	65	32

*Multiply lb N/acre by 2.2 to get lb urea/acre.

Multiply lb N/acre by 4.8 to get lb ammonium sulfate/acre.

Table 3. Potassium requirements for Michigan blueberries.

Soil test (lb K/acre)	Recommendation (lb K ₂ O/acre)
0-24	100
25-49	75
50-74	50
75-99	25
100+	0

canes of intermediate size.

Blueberry bushes are best pruned when dormant, in either late fall, winter or early spring. Spring pruning is usually preferred because canes injured during the winter can be identified and removed. Bushes pruned before leaves fully drop in the fall may bloom a day or two later than bushes pruned in the spring.

PRUNING YOUNG BUSHES

Young bushes require little pruning for the first three years. Remove damaged branches and less vigorous, spindly growth around the bases of plants (Fig. 1A and B) to encourage vigorous upright growth. If possible, remove flower buds also so that young plants use their resources for growth rather than fruit production. Buds may be stripped by hand or pruned off, though either practice is often impractical in large plantings.

PRUNING MATURE BUSHES

Mature bushes should be pruned annually. Follow these general steps:

1. Remove branches injured by winter weather or machinery and diseased canes.
2. Remove fruiting branches that are spindly or less than 1 foot from the ground. Fruits at ground level are difficult to harvest.
3. Remove one or two of the oldest canes and any branches that are low in vigor. (Low vigor canes produce thin, twiggy growth with few

Fig. 1. Young Bluecrop bush before (A) and after (B) pruning. Less vigorous, spindly growth was removed.

A—BEFORE

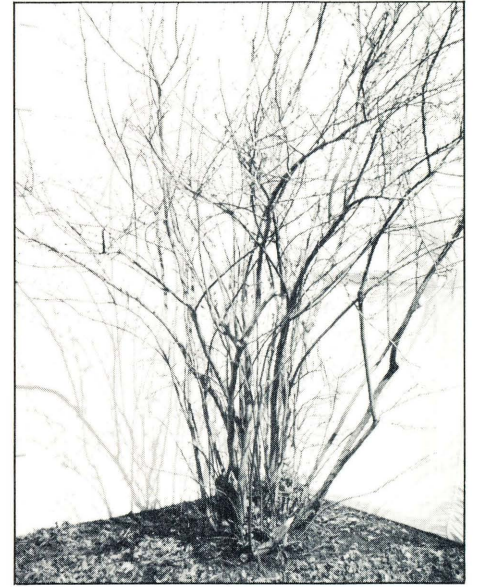


B—AFTER



Fig. 2. Mature Jersey bush before (A) and after (B) pruning. Bush interior was thinned to increase light penetration.

A—BEFORE



B—AFTER

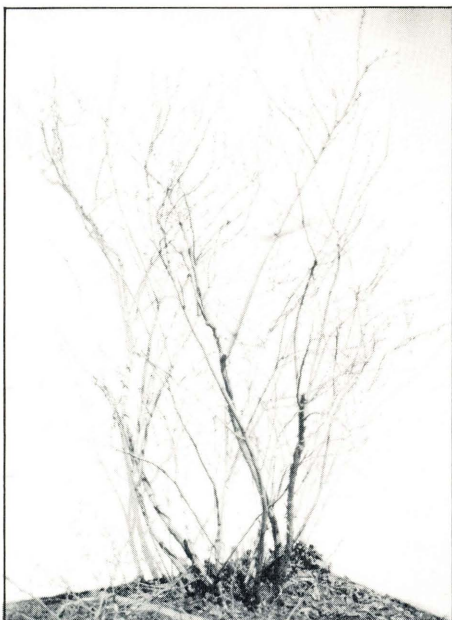


Fig. 3. Mature Berkeley bush before (A) and after (B) pruning. Sprawling canes were removed to maintain a more upright, compact shape.

A—BEFORE



B—AFTER



flower buds.)

Pruning should be used to manage bush size and shape to facilitate picking, fertilizing and spraying. Blueberry twigs require at least 15 percent of full sunlight to initiate flower buds, so varieties that develop thick upright growth need to be opened to sunlight. Several of the large canes on the interior of dense, upright bushes of varieties such as Jersey and Rubel usually need to be removed (Fig. 2A and B). Varieties that have a sprawling, open growth habit, such as Berkeley and Bluecrop, should be pruned to keep the bush shape more upright and compact (Fig. 3A and B). Varieties such as Blueray and Northland may produce too many new canes each year (Fig. 4A) and become overcrowded if they are not thinned (Fig. 4B).

Bushes harvested by pick-your-own (PYO) should be pruned so that fruits are easy to see and reach. Keep the bush interior open. Remove tall or difficult to reach canes or head each back to a vigorous side branch. Remember that heavily pruned bushes compensate for fewer fruits by producing larger berries. Larger fruits are usually more desirable for fresh or PYO marketing.

POLLINATION

Though blueberries are self-fruitful and will set commercial crops without cross-pollination, some studies show that flowers receiving pollen from another variety will produce larger, ear-

lier ripening fruit. Yields from large plantings of single varieties may not be as great as those from multiple variety plantings.

Blueberries require bees for pollination and fruit-set. Though native bees may adequately pollinate small plantings, most commercial growers place honeybee hives in plantings for optimum fruit-set. During average years, two large hives per acre appear to be adequate, though benefits can be gained from as many as four hives.

Bees do not work effectively during cool (cooler than 55 degrees F), windy or rainy weather. If these conditions occur during bloom, applications of gibberellic acid (commercial product "Pro-Gibb") made at late bloom according to label instructions may increase fruit-set. Sprays have little effect during years when pollination conditions are good.

Weed Control

NEW PLANTINGS

Control perennial weeds and grasses before planting blueberries using systemic, non-residual herbicides at the recommended rates. Growing rye or other cover crops for one or two years prior to planting blueberries will also reduce the number of weeds and add organic matter to the soil.

Avoid using herbicides the planting year—they may injure young plants. Control weeds emerging the first year by cultivating. Avoid cultivating deeper

than 1 to 2 inches—deeper cultivation may injure shallow blueberry roots.

ESTABLISHED PLANTINGS

Herbicides and cultivation can be used for weed control in older plantings. Weeds growing between rows during the first part of the season are usually controlled by cultivating or using sods. Often cover crops such as oats, rye or Sudan grass are sown between rows after harvest. This suppresses late-season weeds and tends to harden blueberry bushes for winter and stop wind erosion.

Weeds growing within rows can be controlled with herbicides. Recommended herbicides and instructions for use are updated annually in Extension bulletin E-154, "Fruit Pesticide Handbook."

Disease and Insect Control

Detailed descriptions of the most important blueberry diseases and their control are given in Extension bulletin E-1731, "Blueberry Diseases in Michigan." Blueberry insect pests include plum curculio, blueberry tip borer, leafrollers, aphids, cranberry fruitworm and blueberry maggot. They are described in E-1863, "Common Blueberry Insect Pests and Their Control." Also, consult Extension bulletin E-154, "Fruit Pesticide Handbook," for current pesticide recommendations. Blueberries require several pesticide sprays annually, even in backyard plantings.

Harvesting

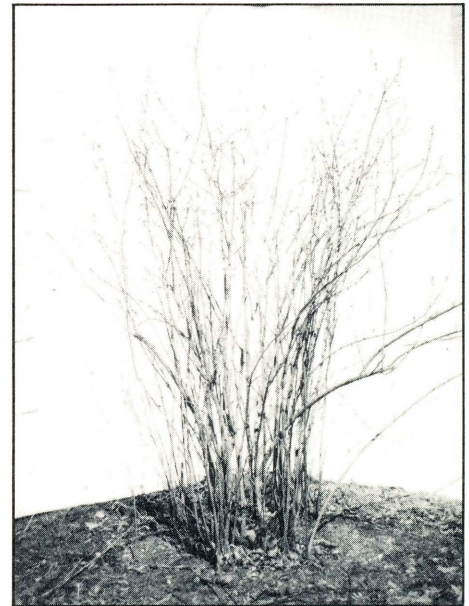
Blueberries usually ripen over several weeks and require two to four pickings to harvest. Hand harvested fruits are picked once per week during most years or more frequently during hot weather. Machine harvested bushes are usually picked when 60 to 70 percent of the fruits are blue and again 10 to 14 days later. Harvest may begin in early July and extend into September, depending on the variety, weather and location.

To pick by hand, gently roll berries between your thumb and forefinger, removing fully ripe berries and leaving unripe berries for the next picking. A picker can collect berries in an open container attached to a belt or cord at waist level. This frees both hands for picking.

About half of Michigan blueberries are harvested mechanically using large over-row harvesters. Harvesters vibrate berries off of bushes and onto conveyors. Mechanical harvesters are usually used for berries to be processed.

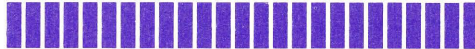
Fig. 4. Mature Blueray bush before (A) and after (B) pruning. Less vigorous new canes were thinned to open the bush interior to light.

A—BEFORE



B—AFTER





Additional Publications

1. Extension Bulletin E-154,
"Fruit Spraying Handbook."
2. Extension Bulletin E-1456,
"Highbush Blueberry Varieties
for Michigan."
3. Extension Bulletin E-1731,
"Blueberry Diseases in
Michigan."
4. Extension Bulletin E-1863,
"Common Blueberry Insect
Pests and Their Control."
5. Extension Bulletin E-2011,
"Highbush Blueberry
Nutrition."



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