

Elderberry

A New Old Crop



Elderberries have been used for thousands of years. Most are indigenous to forested temperate and subtropical areas of the northern and southern hemispheres. Among some 10 known species, two are of interest for the West Virginia area: *Sambucus nigra*, a European native, and *Sambucus canadensis* (also known as *Sambucus nigra* subsp. *Canadensis*), which is native to eastern North America. These varieties of elderberries are used for commercial production.

European red elderberry (*Sambucus racemose*) is also found in the northeastern United States. It is highly toxic to humans and not recommended for commercial fruit production. It is mainly used as an attractive landscaping plant, but extreme caution is warranted due to its toxicity. The seed in the berries, stems, leaves and roots contain chemical cyanogenic glycoside (sambunigrin) that metabolizes within the digestive tract with the help of bacteria into hydrogen cyanide leading to some serious problems (Senica et al., 2019). Eating too many raw berries can lead to build up of cyanide in the body. The best way to use them is in tea, jam, jelly, wine, syrup or pies.

Traditional folk medicine holds the elderberry plant in high regard. It has been known for its many dietetic and medicinal values throughout history. Both its flowers and fruit have been used for jelly, wine, juice and coloring. Those claims are slowly being validated by more recent research. Black European elderberry is rich in vitamins, minerals and antioxidant compounds, mainly anthocyanins. Flowers and fruits contain flavonoids that serve as a base for medicinal and cosmetic uses. These compounds have a soothing effect on psoriasis and many other skin conditions. Black elder has anti-inflammatory and antibacterial properties. It is a component of syrup for sore throat and is used for treatment of mild upper respiratory tract inflammation. Due

to the high content of vitamins and polyphenols, they are used as overall immune system-booster, especially in preventing flu and other “winter ailments.”

Elderberry Basic Facts

Elderberry, or elder as it is also called, is a deciduous woody plant in the form of a clump-like shrub or a small tree. American elderberry (*Sambucus canadensis*) is more shrub-like and can grow up to 8 to 10 feet high, while European black elder (*Sambucus nigra*) has the makings of a small tree and will reach 20 feet. It is well adapted to a wide range of habitats. In search of full sunlight, it is often found in ditches, on the outskirts of the woods, and in damp, wet areas. It performs best in full sun or partial shade. It prefers wet but well-drained soils in gardening zones 3 to 9. It has a thick, mat-like root system that is rather shallow. Leaves are pinnately compound, opposite and toothed (Figure 1). Twigs have prominent corky lenticels, like little warts scattered along the twigs (Figure 2).



Figure 1. Pinnately compound leaf, opposite and toothed. Photo credit: Jamie Wolfe, Preston County



Figure 2. Prominent lenticels on one-year old shoots (a) and older shoots (b). Photos credit: Jamie Wolfe, Preston County



Figure 3. Elderberry flowers in a cyme. Photo credit: Jamie Wolfe, Preston County



Figure 4. Ripe elderberry fruit. Photo credit: Lewis Jett, WVU Extension

Elderberries are one of the first woody plants to leaf out in spring. They start breaking up the buds and leafing out from February to March. European elderberry starts leafing out sooner than American elderberry when grown under the same environmental conditions. Flowers are very small, white or creamy-white with prominently featured stamens and yellow anthers, clustered in round groupings (Figure 3). Flowering and subsequent fruit production is mainly on the periphery of the crown on one-year-old and two-year-old wood. Flowering usually occurs in June with fruit developing and ripening over a period of 6 to 8 weeks from July to the second part of September (Figure 4).

Site Selection and Preparation

Elderberries provide an opportunity for expanded farming along the edges of wooded areas, riparian belt or even on marginalized soils since they can tolerate a wide range of soils and environmental conditions. For best production, elderberries should be planted on sites with full sun exposure, though they will grow in partial shade. The soil should be wet but well-drained. Our West Virginia soils have a lot of clay, and drainage is

generally an issue. To avoid waterlogging and plant drowning, ridge or berm planting is recommended (Figure 5).

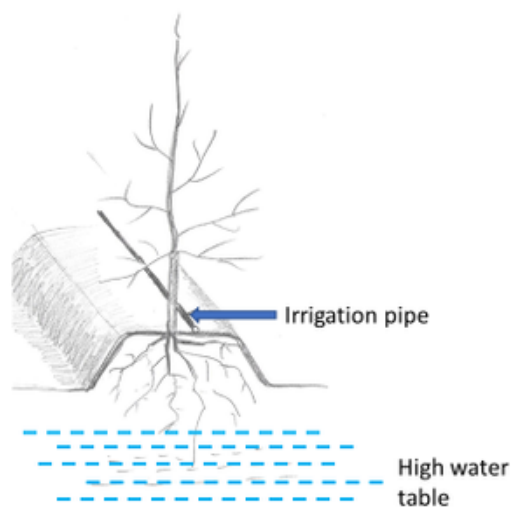


Figure 5. Tree planted on a berm to avoid waterlogging.

Elderberries require slightly acidic soils, but plants will grow within the 5.5 to 6.5 pH range. Nutrient management is based on a soil test. Mature shrubs require up to 80 pounds of nitrogen per acre, depending on their vigor, growth and cropping habits.

Planting and Spacing

Planting can be done either in spring or in fall. In West Virginia, particularly in the Appalachian region, spring planting is preferred to avoid winter injury. Winter injury is mainly due to desiccation and is found on plants that have not hardened off before fall planting, making them prone to winter-freeze injury.

For spring planting, dormant elderberry shrubs will arrive in March or early April. It is best to plant them soon upon arrival, but if that is not possible, they can be stored in a cool place for up to a week. Before planting, place the plants in a bucket of water for a few hours or overnight to rehydrate. Inspect all plants for possible broken or damaged shoots and roots. Remove broken and damaged roots, refresh the cuts on the roots, and cut back the top one-third of the shoots to balance the above-the-ground portion with the available root system. The lowest shoot or branch should be at the top of the soil line or just below.

Water after planting to push out any possible air pockets and ensure good soil contact with the roots. Regular irrigation during the first growing season is recommended, particularly if there is no rain in the forecast. Plants need 1 to 2 inches of water per week. In the first year, all flowers should be removed from the plants to encourage development of the root system. Energy that would have been used for fruit development is redirected to develop a robust root system. To prevent water loss and the roots from drying out, apply 3 to 4 inches of mulch around the base of the plants, especially during the establishment year. The added bonus of mulching is weed suppression. When you eliminate weeds, you eliminate competition for water and nutrients.

Space the plants in a way that allows the shrubs to develop freely without being crowded. The exact distance between the shrubs depends on the given cultivar or variety and its growing habits, mainly its spread and height. If the cultivar in full maturity has a 6- to 8-foot spread, then the plants should be placed at least 8 to 9 feet apart within rows. The distance between the rows should be one-and-a-half-times the plant's height at maturity. If the shrub can reach 8 feet in height, the distance between the rows should be 8 feet plus 4 feet, which equals 12 feet.

Suggested Cultivars

The following are cultivars available from nurseries.

Adams

The Adams No. 1 and Adams No. 2 cultivars were selected from the wild in New York in 1926. Both have large fruit, but Adams No. 2 has the largest fruit of all elderberries. Shrubs are vigorous with a strong upright growth habit. These cultivars are very winter hardy and are suitable for hardiness zones 3 to 9. Shrubs can reach between 6 to 10 feet in height and 6 to 8 feet in width. Fruit ripens in August. Fruit is purple, firm, juicy and sweet. The Adams cultivars are among the most productive cultivars. Flowers are used for tea and wine. Ripe berries are used for juice, jellies, wine or drying.

York

The York cultivar originated at the New York Agricultural Experimental Station. This is a hybrid between cultivars Ezyoff and Adams No. 2. It was released in 1964. It tolerates cold well and is suitable for growing in zones 4 through 8. This cultivar has large cyme loaded with white flowers. Fruit ripens in mid- to late August. Fruit is medium to large, purple to almost black, glossy, soft, juicy and sweet. It has a vigorous, upright and somewhat spreading growth habit. It is 6 to 10 feet high and 6 to 8 feet wide. This cultivar is good for wine, pies, jam and jelly. It is very pigmented and often used as a natural dye.

Johns

The Johns cultivar originated at the Kentsville Research Station in Nova Scotia. It is an open pollinated Adams No. 1 or Adams No. 2 seedling. It was released in 1954. It is suitable for growing in hardiness zones 3 through 9. It has medium-sized cyme with white flowers. It exhibits extremely vigorous upright growth. Glossy foliage makes it a very interesting landscape specimen. Its fruit ripens in mid-August. The fruit is purple-black, glossy, firm, sweet and juicy. Shrubs are 8 to 10 feet tall and 6 to 8 feet wide. This cultivar is excellent for wine, juices, jellies, jams and pies.

Nova

The Nova cultivar is an open-pollinated seedling of Adams No. 2, selected in 1946 and released by the AgCanada Research Station in Kentville, Nova Scotia, in 1959. It was named by the province of origin. It is winter hardy in zones 4 through 8. It is a multi-stemmed shrub with a vigorous and upright growth habit. It has wide clusters of creamy-white flowers. Fruit ripens in early August. It bears large, purple-black, soft, sweet and juicy fruit. In full maturity, it is 6 feet tall and just as wide. Excellent for wine, juice, jam and jelly.

Ranch

This cultivar was found growing at an abandoned homestead, hence the name Ranch. It is believed that it was planted in the late 1800s. It is one of the best varieties for poor, non-fertile soils. It is extremely drought tolerant. The Ranch cultivar performs well under poor environmental conditions. It is a multi-stemmed shrub with vigorous and upright growth habit. It is a determinant cultivar, flowering only in spring, around May or June. It has large cyme with creamy-white flowers. Fruit ripens in August. It has small, black, glossy, sweet fruit. Reportedly, this cultivar is high tolerance to pests and diseases.

Bob Gordon

This cultivar was selected from the wild by Bob Gordon near Osceola, Missouri, in 1999. It was introduced by the University of Missouri in 2011. It is very winter-hardy. Good for hardiness zones 3 to 9. It is a determinate cultivar that flowers from the late May through mid-June. It has large flower clusters with white flowers. This cultivar produces vigorous open to upright shrubs that can reach 6 to 8 feet in height and 6 to 8 feet in width. It ripens at the end of July through the first part of August. It produces small to medium fruits that are purple and sweet. Once dormant in fall, plants could be cut down to the ground. They will produce fruit on primocanes, which are the current season's growth.

Wyldeewood

The Wyldeewood cultivar was selected from a wild population near Eufaula, Missouri, by P.L. Byers and A.L. Thomas of University of Missouri/Missouri State University in 2010. It is tolerant to extreme cold and can be grown in zones 3 to 9. It also is tolerant of a wide range of soils. It exhibits vigorous growth. It has huge flower clusters that are 2 inches wider than the clusters of any other cultivar. The creamy-white flowers are densely clustered in a cyme measuring a foot across. It is an indeterminant cultivar, which means its flowers all season long and produces flowers and ripe fruit at the same time. This cultivar's best pollinators are Ranch and Bob Gordon. It is a very heavy producer, and its fruit ripens in August. It produces small, dark purple to black fruits. It is excellent for jam, jelly or wine.

Samyl

The Samyl cultivar originated at the Research Center for Horticulture in Aarslev, Denmark. This is a European black elder. It shows vigorous upright growth. It is classified as a shrub or a small tree. It has large cyme with very high-quality flowers. It has very high anthocyanin content and is highly valued for its medicinal benefits, particularly for its immune-boosting properties. It is primarily recommended for juice, but it could be used for pies, wines, jelly and jam.

Korsor

The Korsor cultivar originated in Denmark. It has very high anthocyanin content. It is commercially grown in Europe. This cultivar is exceptionally winter-hardy and tolerates temperatures well below 0 F. It produces a shrub or a small tree that is very vigorous with an upright growth habit. It can grow to be 6 to 8 feet tall and 8 feet wide. It is partially self-fruitful. It has white flowers clustered in a large cyme. This cultivar's fruit ripens in August through September. It produces large, black, glossy, sweet and juicy fruit. Tea from its flowers encourages sweating and fever reduction. The berries are used as an anti-viral and immune system enhancer.

Historically, it has been used as a winter cold reliever. The leaves are used to make poultice for external use as an antiseptic and for bruise healing.

Care

Regular insect and disease protection, nutrient management, weed control, wildlife management and maintenance pruning are part of the care required throughout the production life of the elderberry planting.

Wildlife Management

It has been known that wildlife gravitate toward elderberry standings. All parts of this plant provide food for various wildlife. Deer will browse on the leaves, twigs, fruit and occasionally, flowers of elderberry plants. Nature books and field guides indicate that 45 species of birds as well as raccoons, mice and squirrels will find elderberries to be a great source of food. This is something to keep in mind when adding elderberries to your landscape, garden or trying to establish a specialty crop for commercial production. Economic impact due to the wildlife damage can be significant.

Insect Management

Elderberries have relatively few pest and health problems. Though, a few new invasive species are presenting a serious threat – spotted wing drosophila being one of the newest problems. Some other common elderberry pests are Japanese beetle, elderberry shoot or cane borer, elder borer beetle and eriophyid mites.

Spotted Wing Drosophila

Spotted wing drosophila is a new invasive species that came to the United States from Asia. It was first discovered in California in 2008 and has since been reported in most states. It has been in West Virginia since 2011. SWD is particularly attracted to the ripening fruit. Eggs are deposited in fruit as it ripens and in over-ripe fruit. Larvae feed within the fruit, causing it to become soft and drop. Monitoring is essential to determine the emergence and presence of the insect to plan effective control.

Eriophyid Mites

These mites are very small and cannot be seen by the naked eye. They overwinter under the bud scales with their highest number near the terminal growth. The symptoms of their presence appear as crinkling, folding and cupping of the leaves. They do not life-threatening damage. Most often, beneficial mites take care of them so the miticide applications are not necessary.

Japanese Beetle

Japanese beetles (*Popillia japonica*) are foliar feeders and can inflict serious damage to the leaves. The beetle overwinters in its larval form, referred to as grubs. Larvae burrow themselves 8 to 10 inches deep in the soil to avoid being killed by the frost. Grubs start ascending toward the surface as the soil warms up. Along the way, they will feed on the roots of mainly grasses, but they are not partial to them and will consume anything edible in their way. By late May to early June, they will pupate and emerge as adults at the end of June to mid-July. The adult beetles will spend the next 30 to 45 days feeding and mating. Females will lay the

eggs 2 to 6 inches deep in the soil during July and August. It takes 10 to 12 days for the eggs to hatch. The new grubs inflict damage as they feed on organic matter in the soil, mainly roots. As the temperature drops and the soil cools, they move deeper into the soil where they wait until next spring to start the cycle all over again. Grubs spend up to 10 months underground. Normally, there is only one generation a year, but in the northern areas, the species may take two years to complete the life cycle.

Cane or Shoot Borer

Cane or shoot borers (*Achatodes zeae*) are moths. The eggs hatch in April to May and larvae first start feeding on young, developing leaves. Soon after, larvae start boring into the young shoots, leaving a visible hole on it. They start burrowing into lateral shoots then migrate toward the lower part of the main, primary stem, near the ground. They feed on the inner side of the cane causing wilting and die-back. In early summer, fully grown larvae will move from shoots into the dead canes and pupate. Adult moths emerge from the dead canes and will start laying eggs in July and August in canes that are at least one year old. Eggs hatch the following spring. Sanitation or removal of the dead and/or infested canes is part of shoot borer management.

Elderberry Borer Beetle

The female elderberry borer beetles (*Desmocerus palliates*) lay their eggs near the plant base. Hatched larvae burrow their way into stem, tunneling and eating their way into roots. As they mature, larvae migrate from roots upward into canes, where they pupate. It may take up to two years for the larvae to mature. The adult beetles emerge and feed on leaves and flowers.

Disease Management

There are a few diseases found in elderberries. Some present a perennial problem, while others may be more sporadic, driven by the environmental conditions each year. For infection to occur and disease to develop, three things must coincide – presence of a susceptible host, presence of a pathogen, and suitable environmental conditions (rain/moisture, duration of wetting period, temperature, wind, etc.).

Pathogens causing elderberry diseases are fungi and viruses. Disease control success will greatly depend on recognizing symptoms and knowing biology and requirements needed for disease development. Manipulation of these micro-environmental factors through cultivation, sanitation, weed suppression and other cultural practices will aid in combating the problem.

Tomato Ringspot Virus

Tomato ringspot virus (TmRSV) is probably the most important and most serious disease that attacks elderberry plants. It will weaken the plant, leading to reduced production, and can even kill the plant. It is spread by nematodes, certain weeds like dandelions, and pollen. The foliar symptoms on leaves usually show chronic line patterns, oak-leaf pattern and sometimes green spots, while some plants can show just a general chlorosis or a light-green, dark-green mottle. Unfortunately, there is no cure for this virus and what started as plant decline, reduction in yield, shoot dieback and cold temperature survivability will lead to the death of a plant. It is a good practice that a virus-infected plant be removed from the planting and destroyed by burning. Whenever pruning plants that might be virus infected, it is necessary to observe strict tool sanitation after each cut. Prevention is the best management practice. Even before planting, soil should be checked for nematodes

that carry and transmit the viruses. Weed control is part of a good TmRSV prevention and management strategy as well.

Fungal Canker

Drought, flooding and winter injury can leave elderberry plants open to canker-causing fungi. *Cytospora*, *Diplodia*, *Nectria*, *Neonectria*, and *Sphaeropsis* spp. are fungi that have been associated with cankers and mortality of the distal end of elderberry canes. Cankers appear on an elderberry as sunken wood or flesh on the trunk or stem. More obvious signs may include wilting or browning of leaves. Prune out infected branches as soon as you notice them to stop the disease from spreading. Remove the entire plant if the canker reaches its trunk.

Powdery Mildew

Powdery mildew is one of the most common and important diseases in ornamentals and fruit trees. It is mainly a problem in shaded, thick and humid areas with poor air movement. Fungus requires a live host to grow and thrive. The presence of a mildew is readily observed at the terminal growth on young and expanding growth. However, it is present on shoots, leaves, buds, flowers and fruit.

Symptoms appear as mycelia (vegetative growth) on the surface of the leaves and as spores (conidia) on the underside of the leaves in the form of whitish-gray structures. These structures resemble flour, hence the name powdery mildew. These lesions spread very rapidly and intensify the problem. The fungus overwinters as mycelium in buds infested in the previous summer. As soon as the buds break open and the new leaves start to emerge, they carry the mycelia that starts to produce spores (conidia). Conidia are carried throughout the shrub and the orchard by wind and land onto the unfolding, developing leaves and new shoots. Rain is not necessary for this disease to spread and develop. High humidity and poor air movement are sufficient for infections to start.

At the end of the summer when the seasonal growth stops, small, dark, roundish structures start to appear to carry the spores (ascospores) through unfavorable conditions – for example, in cases where there are no remaining hosts. Normally, buds infected with fungal mycelia are less winter hardy and would sustain high mortality at temperatures lower than 15 F below zero.

The best powdery mildew management is to do sanitation by removing infected leaves and to do annual pruning to remove infected shoots and buds. It also helps to thin the shrubs and their crowns. Make them less dense and allow for better air movement, faster drying conditions and better sun penetration.

Verticillium Wilt

Verticillium wilt is a soil-borne disease caused by the fungus, *Verticillium dahlia*, that can affect more than 350 plant species, including elderberries. Symptoms include general plant decline, wilting (often on just part of the plant) and leaf-edge browning. It does not take long before these branches and shoots die. Making a cross-sectional cut will reveal a streaky discoloration of the conductive tissue below. The color is dark olive green to black. The fungus can build up a very high population on weeds, like lambsquarters, pigweed, ground cherry and nightshade, or on some garden crops, like tomatoes, strawberries, eggplants, raspberries, potatoes and peppers. The fungus enters a susceptible host through its root systems, then continues spreading through the

conductive, vascular system. The best control is by avoiding planting on sites where any of the verticillium-susceptible plants were grown. The fungus can survive in its resting structures, microsclerotia, for many years before it encounters a susceptible host and proper environment.

Root Rot

Root rot and collar rot are fungal diseases caused by the fungi from the *Phytophthora* spp. Plants start declining and showing signs of yellowing, wilting and ultimately dying. The characteristic symptoms are at or just below the soil line. There is an indentation, indicating a canker. Cutting into it will reveal brown to reddish-brown discoloration of a dead, slimy, wet area. Cankers girdle the roots that results in pale foliar coloration, inadequate water and nutrient supply, poor terminal growth, and eventual death. It usually takes about three years before the death of a shrub or a tree. This disease becomes a serious problem where there is poor drainage or frequent flooding. Fungal infections are favored by frequent cool and damp periods. Spending time to select a good, well-drained planting site is the first step in avoiding this problem. Sometimes, tilling will improve the drainage situation. If there is no other option, planting on raised beds will allow the root system to grow above the troubled, poorly drained area.

Nutrition

At the time of planting, there is no need to add nitrogen, but some starter fertilizer would be beneficial to help root system development. Nutritional management of the fruit-producing plants should be based on a soil test and leaf analysis. These tests should be done every two to three years to monitor the pH levels as well as the nutrient levels within the plants. This information will serve as a base for making any necessary adjustments to maintain pH at the optimum level as well as satisfy nutritional needs of the planting. Mature plants may need about 1 to 2 pounds of nitrogen per 1000 square-feet or 60 to 80 pounds per acre.

Pruning

Since most of the cropping occurs on one- and two-year-old wood, pruning as part of the regular maintenance is highly encouraged. Pruning keeps the best fruit-producing wood young, ensuring the most efficient production of the highest quality fruit. Late winter to very early spring pruning will keep the plants clean, void of any thick, bunched up shoots or diseased and/or insect-damaged twigs. Pruning out all the suckering growth around the base of the plants is important to keep them clean as well as to suppress the invasive tendencies of spreading too fast. Mature elderberries should have five to eight canes per bush. This type of cane density will allow for good light penetration, good air movement through the bush and faster drying conditions, which will minimize the possibility for fungal disease development.

Propagation

While pruning, set aside some of the nice, healthy one-year-old shoots that are at least pencil-thick as hardwood cuttings to be used for propagation. Elderberries could be easily propagated by hardwood cuttings. Previous seasons' shoot growth is selected and cut to about two to four nodes, 7 inches or so, for rooting. Cuttings could be rooted immediately upon harvesting or could be preserved in the refrigerator up to six weeks. Use of rooting hormone is recommended. The basal end, cut just below the node, should be dipped into the rooting compound and placed into a sterile rooting medium that will ensure a moist, well-drained environment for rooting. Cuttings should be kept warm and moist but not soggy-wet. It takes about six weeks

for cuttings to root fully. Summer cuttings work even better. Take them as the new shoots start to develop until July. When using summer cuttings, all leaves but the basal two leaves should be removed. Propagating from seed is not recommended, particularly for commercial fruit production, due to great genetic variability. Seedlings vary greatly in their phenological characteristics and their cropping potential.

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