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Figure 1. Pawpaw trees with fruit growing in a research orchard in Ohio.

Pawpaws: An Alternative Fruit Crop in the Midwest

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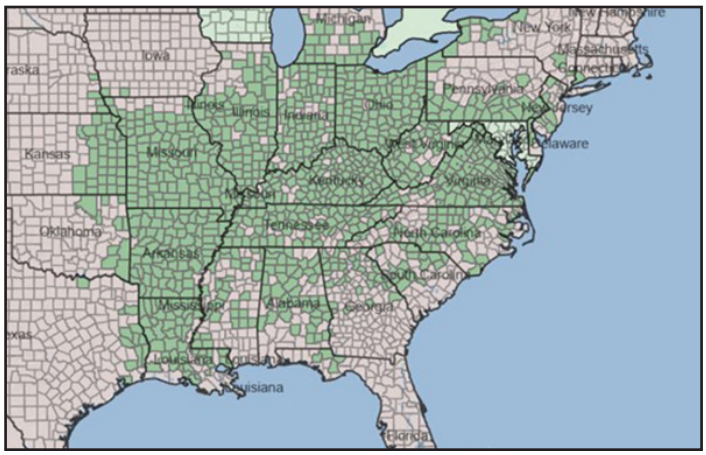

USDA Natural Resources Conservation Service, n.d.

Figure 2. Distribution of pawpaw (***Asimina triloba***).

The pawpaw (*Asimina triloba*) is a native North American understory tree, known for producing the largest endemic, edible fruit in Ohio (Figure 1). The tree grows throughout the state as was shown by a 1969 survey of native and naturalized woody plants that found pawpaws growing in 80 of Ohio's 88 counties (Braun, 1969). In 2009, pawpaw was declared Ohio's native fruit (Ohio.gov, 2025). In the United States, *Asimina triloba* is the northernmost member of the *Asimina* genus. The other seven to nine members of the genus are found in more southern regions of the country. *Asimina* belongs to the *Annonaceae* family, a diverse group of tropical and subtropical flowering plants comprising approximately 108 genera and 2,400 species (Pomper & Layne, 2004). Notable members of this family include the custard apple, cherimoya, and soursop.

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The pawpaw occurs as a deciduous, sub-canopy tree in the wild and is native to the mesic hardwood forests and riparian regions of eastern North America (Pomper & Layne, 2004). The tree is commonly found in the understory and thrives in deep, moist, well-drained soils, reaching a mature height of 20–35 feet. Pawpaw is hardy from the United States Department of Agriculture (USDA) zone 5A to zone 9. Its distribution ranges from eastern Kansas to western Connecticut, wrapping around the Great Lakes (Figure 2). They grow as far south as Louisiana and the Florida panhandle (USDA Natural Resources Conservation Service, n.d.).

Pawpaw trees have large, dark green, simple, entire leaves (neither toothed, lobed, or compound), that are up to a foot in length and are alternately arranged on the twig. Leaves turn rusty yellow before being shed in the autumn, exposing gray-brown twigs with fuzzy buds that lack bud scales unlike many common native trees such as oaks, maples, and buckeyes. Vegetative buds (leaf and shoot producers) are elongated and pointed, while floral buds (flower producers) are round (Figure 3).

Historical Connections

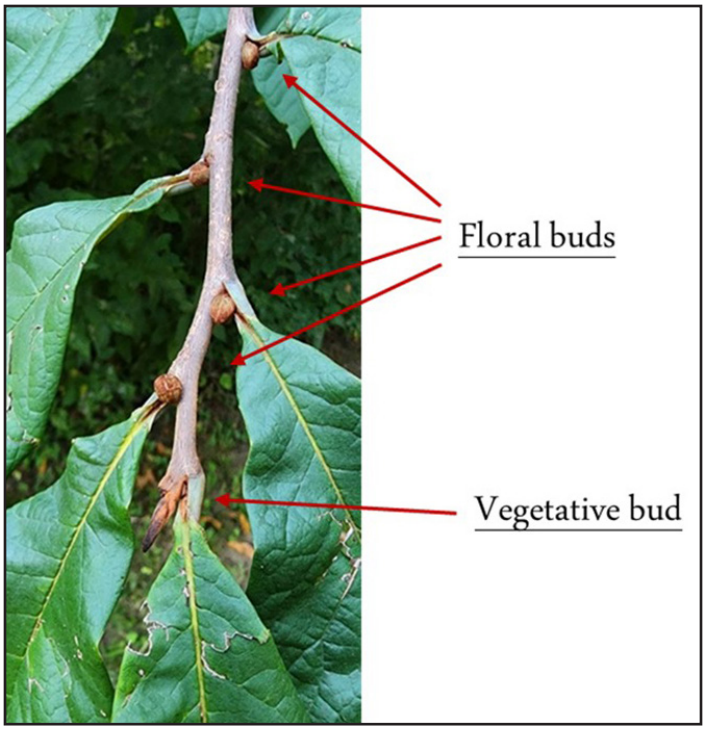
Pawpaw has a rich history that extends from pre-colonization to the present day. Fruit were routinely collected and consumed by the Cherokees and Shawnees, and fibrous parts of the plant were used for other needs (e.g., fishing nets, rope, strings) (Allard, 1955). European settlers also valued the species, and for centuries pawpaw played an important role in the folklore, culture, and local economy of residents in Appalachia and surrounding regions (Moore, 2015).

The literature suggests that George Washington enjoyed eating pawpaw fruit and planted pawpaws at his Mount Vernon estate (Hormaza, 2014). Thomas Jefferson included pawpaws in his historically famous garden at Monticello (Stanton, 2013). During the 1804–06 Corps of Discovery expedition to explore and map the recently purchased Louisiana territory, Lewis and Clark documented pawpaws (Bowen et al., 2004). While on the expedition, William Clark recorded in his diary that "they (the expedition members) can live very well on the pawpaws" (Hormaza, 2014), as food for the 50-man troop was rationed once they reached western Missouri. Medsger (1976) documented that the men gathered and ate pawpaws to supplement their diets.

Pawpaw became well accepted into the European settlers' diet as an occasional woodland treat (Compton, 1986). Carmer (1942) documented that pawpaw harvesting was an occasion for celebration among the settlers, which led to the early development of American folk songs and poems. Pawpaw-related poems are frequently referenced to James Whitcomb Riley (1849–1916) (McPherson & McPherson, 1977).Two photos aligned horizontally.

Physiology and Propagation

Like many temperate, fruiting trees, the flower buds require at least 400 hours of temperatures below 45 degrees Fahrenheit to trigger (vernalize) flowering and produce viable flowers for fruit production (Peterson, 1991). The floral buds of pawpaws form in the autumn and flowers emerge in the spring, prior to leaf emergence. Flowers typically hang like a pendant, grow singly on the twig with six bell-shaped petals, and change from green to purplish-brown as they mature (Figure 4).



Carrie Brown

Figure 3. Pawpaw leaves alternately arranged on the twig. Floral and vegetative buds identified.

Ann Chanon

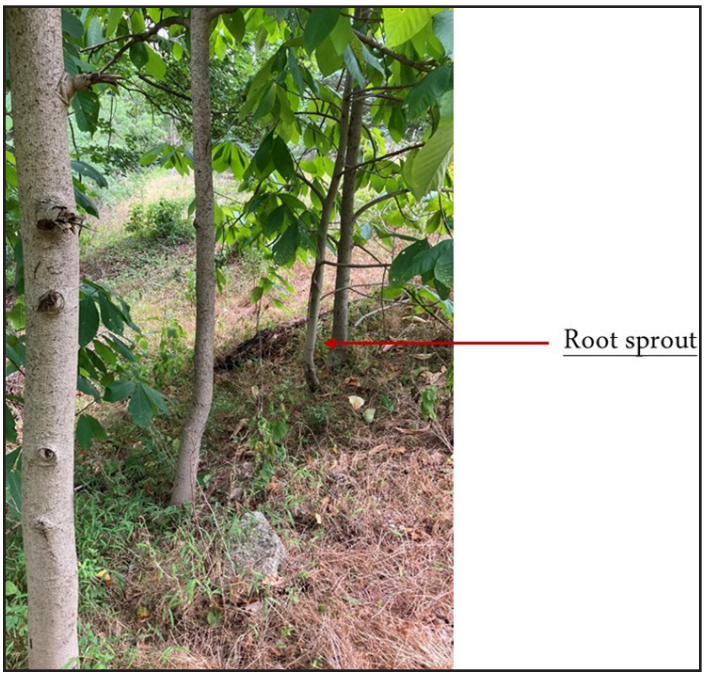
Figure 4. Pawpaw flowers change color as they mature.

Carrie Brown

Figure 5. Cluster of immature fruit formed from a single flower.

Sarah Francinco and Logan Minter

Figure 6. Pawpaw pulp is soft, yellowish-orange in color, and embedded with seeds.



Dan Lima

Figure 7. Pawpaw can reproduce asexually by forming colonies from root sprouts.

The pawpaw flowers are perfect (have both female and male parts) and protogynous (the female portion of the flower matures before the pollen is shed).

The protogynous characteristic of pawpaw flowers can be interpreted as a reproductive strategy to ensure cross-pollination. While well-known cultivated plants like tomatoes (*Solanum lycopersicum*), sweet pepper (*Capsicum annuum*), and green beans (*Phaseolus vulgaris*) have perfect flowers and self-pollinate, pawpaw flowers are different. They require two genetically different plants to fertilize and produce fruit. In practical terms, an established orchard or woodland must have two or more genetically different trees for flowers to pollinate and bear fruit. An unfortunate and common mistake made by inexperienced growers is establishing an orchard using a single pawpaw variety due to desirable fruit traits or personal preferences. In these cases, the trees seldom bear fruit unless the flowers are pollinated manually or by insects that have come into contact with genetically different pawpaw pollen elsewhere. Potential native pollinators of pawpaw include early-emerging beetles and flies.

A single fertilized flower can develop into a cluster of large yellowish-green fruit (Figure 5). The average fruit are typically 2–6 inches in length, weigh between 4.4 and 12.3 ounces (Signorini & Francino, 2024), and have six to 15 inedible brown seeds (Thapa Magar et al., 2025).

Pawpaw seeds can be over one inch in length and are embedded in a yellowish-orange pulp (Figure 6). In Ohio, pawpaw fruit typically ripen in September in a rather short harvest window of three to five weeks depending on weather conditions and the cultivar.

Pawpaw trees can also reproduce asexually by sending up root sprouts (rootsuckers), a process known as 'suckering.' This clonal propagation results in genetically identical trees forming around the parent tree (Figure 7). Transplanting rootsuckers, however, is not recommended because they seldom grow secondary roots of their own, frequently leading to unsuccessful transplantation efforts.

Propagation via seedings may be an option depending on the growers' intention. One must keep in mind that the protogynous characteristic of pawpaw plants does not guarantee that a seedling tree will bear fruit with the same traits as the parent plant.

One tactic used to grow a pawpaw with the same genetic identity as a desirable tree is to graft a scion (young shoot or twig) extracted from the desired tree into a rootstock pawpaw (tree from which offshoots have grown). A rootstock plant is often cultivated from seed to provide the root system for the grafted plant. Its genetic traits are not expressed in the flowers or fruit of the grafted plant.

Pests and Diseases

Pawpaw trees and fruit tend to have few diseases and insect pest issues due to their natural occurrence in Ohio. The peduncle borer (*Talponia plummeriana*), the Asian ambrosia beetle (*Xylosandrus crassiusculus*), and the Asimina webworm (*Omphalocera munroei*) are three insect pests that have been observed and reported by pawpaw growers. In addition, the larvae of the Zebra swallowtail butterfly (*Eurytides marcellus*) feed on pawpaw foliage but seldom cause production losses. Pawpaw is the primary host plant in North America for the Zebra swallowtail butterfly whose larvae co-evolved with the *Asimina* species (Haribal & Feeny, 1998; Scott, 1986). Diseases with observed occurrence (Figure 8) include the flyspeck, the sooty blotch, the bordered leaf spot (*Phyllosticta* sp.), the blue streak (*Pythium* spp.), the black spot (*Diplocarpon* sp.), and the tobacco ring spot virus (Pomper & Layne, 2004).

Fruit Characteristics and Production

The fruit pulp has a custard-like texture, and the flavor is reminiscent of mango, pineapple, banana, papaya, citrus, and other tropical fruits (Brannan et al., 2012). The taste is reflected in its many local names including wild banana, Appalachian banana, and hillbilly mango (Schweitzer, 2017). Pawpaws are rich in vitamins C, B-6, riboflavin, niacin, folate, and thiamine, and contain minerals such as iron, potassium, magnesium, and phosphorus (Brannan et al., 2021; Kobayashi et al., 2008). The fruit can be eaten fresh; however, sale of whole fruit can be difficult due to the brief harvest window and its short shelf

life. Practical knowledge suggests that tree-ripened fruit lasts between three to five days at room temperature. Extending the fruit's shelf-life in a manner that maintains the fruit's properties and flesh quality is possible using refrigeration. As a result of the fruit's short shelf life, much of the current industry is centered on the production of pawpaw pulp, which is used to manufacture a variety of value-added products, including jams, sauces, baked goods, ice cream, and alcoholic and non-alcoholic beverages (Duffrin & Pomper, 2006).

When not harvested for human consumption, the fruit is often consumed and then its seeds are dispersed by wildlife including opossums, raccoons, squirrels, deer, foxes, bears, and some birds. The leaves, bark, twigs, unripe fruit, and seeds contain natural herbivory deterrents (Annonaceous acetogenins) and asimicin, which have been reported to have pesticidal properties (Potts et al., 2012).

Increased demand for fresh pawpaw fruit and various value-added pawpaw products has resulted in more pawpaw cultivation and orchard establishment. For orchard establishment, grafting is the most effective method for propagating pawpaw cultivars to create populations with known genetic identities. Clonal populations are desirable as they ensure that each tree will grow and produce fruit consistently from year to year. Pawpaw can also be propagated by seed. Seeds are collected from mature fruit, washed, and stored immediately in a moist medium such as vermiculite, potting mix, or peat moss before germinating. Seed should not be dried out as desiccation can negatively impact germination (Pomper & Layne, 2004). The seeds also require a 60–120-day cold-stratification pre-treatment prior to germination.

In recent years, several new cultivars that were selected based on taste, size, seed-to-pulp ratio, flowering/fruiting timing, and suitability for orchard establishment, have been released (Layne, 1996; Pomper et al., 2008). Popular cultivars found in Ohio include Davis, Sunflower, NC-1, Potomac, Shenandoah, and Allegheny. Descriptions of fruit characteristics and taste profiles for these varieties can be found in Blake (2022) and Adainoo et al. (2022). In Ohio and surrounding states, pawpaw production is an emerging industry with production primarily concentrated in small orchards. These small farms have an average of 22 fruit-bearing trees that yield 9.5 pounds per tree per year. Depending on the cultivars, data from skilled producers suggest that mature trees can produce 23 pounds of viable fruit per year under appropriate cultural practices and weather conditions. Observed decreases in production are attributed to differences in technical knowledge and experience in growing pawpaws for commercial purposes versus personal use. Furthermore, a substantial number of young trees are expected to enter production in the next few seasons. Pawpaw tree sales at Ohio nurseries have increased consistently between 2021 and 2023, which may positively impact production volume and yield within four to five years (Signorini & Francino, 2024).

While pawpaw has been used as a foraged food crop in North America since ancient times, research is targeting modern production of pawpaw through the use of improved horticultural techniques to develop a locally and internationally cultivated crop.

Sarah Francino.

Figure 8. Pawpaw fruit showing symptoms consistent with *Phyllosticta* sp., a fungal pathogen.

Acknowledgments

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