

Specialty Crop Profile: Pawpaw

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The following article is the second and final part of this specialty crop profile on pawpaw:

PART 2: GROWING PRACTICES

Site, Soils and Preparation

Though pawpaws are capable of fruiting in the shade, a full sun location will result in best production. Rows should be oriented north/south. When possible utilize higher ground and avoid bottomland sites that flood and are frost prone. Pawpaws flower early in the season and like other orchard crops may be susceptible to late spring frost and subsequent flower damage. Elevation will provide some measure of frost protection, and allow for faster surface drainage of water. Windbreaks may alleviate leaf damage in very windy, exposed sites.

Best soil types should be well drained and deep, without a clay pan. Avoid soils that are heavy, tend to water log, or have a high water table in the winter. Depending on soil test, adjust phosphorus (P) and potassium (K) levels to 75 and 300lbs/acre respectively, and lime to bring soil pH to 6.0-6.8. The planting site should be moldboard plowed or chiseled to incorporate amendments, and worked level and smooth. A common practice in peach production is formation of a raised planting area 4-6' across and 3-6" high, and for pawpaws, this too may be advantageous in heavier soils to promote internal soil drainage.

Propagation and Cultivar Selection

Pawpaw trees can be acquired by collection of young trees from the wild, propagation by seed or by nurseries as a bare-root or container grown trees. Any seedling tree taken from the wild is an "unknown" in its fruit bearing qualities, and all seedlings, regardless of parent tree will express variability. Nursery or grower grafted trees, using wood from a named parent, is the only means to ensure a true clone, and provide known performance.

Collection of trees from the wild is usually unsuccessful for several reasons. Pawpaws tend to send up root suckers from a "mother tree". These root suckers are true clones, but they tend to be poorly rooted, and rarely survive transplanting. Transplanting a seedling will be more successful than a root suckered tree. Distinguishing a seedling from a root-suckered tree can be difficult; look for trees growing alone where seeds may have dropped, and dig only smaller specimens. Trees should be dug in the spring, when buds are beginning to swell. As pawpaws in general are weak, brittle tap-rooters, it is critical to take a good soil ball and avoid root damage. Bare rooted wild seedlings will have a poor chance of establishment. Trim tops to compensate for root loss.

Seeds propagation is another method that is slow, but not difficult, provided certain conditions are met. Collect seeds from soft ripe fruit. Macerate the fruit and float the pulp off in water. Seeds can be dipped in a 10-20% bleach solution to reduce bacteria and fungi problems in storage; be sure to rinse seeds well after dipping. Pawpaw seeds should never be allowed to dry out, or germination ability will be lost. Once cleaned, store seeds in a ziplock bag and slightly moist sphagnum peat moss. Seeds have a dormant, immature embryo, and require stratification (time and cold) under refrigerated conditions (32-40F) for 80-120 days before they will germinate. Refrigerated, moist seeds can be stored for up to a year or more. Following stratification, seeds should be sown in a well-aerated soil mix, with a temperature optimum of 75-85F. Use tree pot containers (14-18" deep) that will allow room for taproot formation. Seeds will germinate in 2-3 weeks, form a taproot, and then send up a shoot in two months. Freshly extracted seeds can be sown directly outdoors in seedbeds in the fall; expect germination to occur the following year in July or August.

Field grown seedlings should be dug, or transferred to a pot or permanent site in the spring as plants come out of dormancy.

It is possible to use seedling trees as rootstock, and graft a named cultivar to it. This is the most economical method of propagation of a known cultivar. Pawpaws are easily grafted or budded using whip and tongue grafts, and chip budding. Avoid t-budding, which has been unsuccessful. Softwood and hardwood cuttings have also been proven to be unsatisfactory methods of propagation.

Named and grafted cultivars, as well as seedling trees are available from nurseries. These container-grown trees have given the best field results. Grafted trees will be identical to the parent assuring fruit quality. Numerous named cultivars can now be commonly found in the nursery trade: "Sunflower", "Taylor", "Taytwo", "Mary Foos Johnson", "Overleese", "Mitchell", "Davis" and "Rebeccas Gold" are some examples. Each cultivar has its particular characteristics. Keep in mind that two or more cultivars are needed for cross-pollination in the orchard. Grafted trees are usually two years old, and will be more expensive than seedling trees. Always buy trees in containers (preferably deep ones), and avoid bare root trees.

Planting and Establishment

Ideal planting time for dormant stock is in early spring. Trees should be set in rows at a minimum 8' spacing, with rows 18-25' apart (depending on equipment access needs). Plant trees at the depth they were grown at the nursery. Take care not to damage the root ball as it is removed from the pot. Trees will often be sparsely rooted and the roots brittle. An addition of a handful of soil from a native pawpaw site to the planting hole may be helpful for the introduction of mycorrhizal fungi. The symbiotic relationship between tree and fungus aids in growth promotion.

However, keep in mind, this relationship, its occurrence and benefits, are currently being debated among scientists and current growers as to its importance, and only research will confirm the usefulness of site inoculation.

New trees should be watered in well and fertilized with a liquid soluble fertilizer mix such as 20-20-20. Follow with additional applications at 4-week intervals through June. Repeat in the second year. Trees should not be allowed to dry out during the first two years of establishment. Mulching with various organic materials may be helpful to maintain soil moisture status. Care should be taken in the winter months to address vole and mouse control under the mulch. Plastic tree tube shelters, used in reforestation, work well for protecting the new seedlings from sunlight the first year. These tubes should be removed by mid-August, to allow for tissue hardening for winter. Tubes left on trees too long will result in significant winter damage. If using grafted trees, monitor bud breaks, and remove any shoots originating below the graft union. Otherwise little corrective pruning is recommended as long as a distinct central leader is forming.

Information of the care of established trees is limited and based on educated assumptions. Fruit are borne on previous year's wood; and, like peaches, proper pruning and adequate fertility is needed to keep trees vigorous and producing many annual shoots. Currently a central leader tree is recommended, with topping at about 15 feet to control height. To maintain good air movement and light penetration, the canopy may require thinning. Annual nitrogen application rate requirements are at best an estimate. However sparse root structure and high foliage densities would indicate moderate rates may be needed, with a timing split of the total rate between early spring and again after fruit set. Should no crop set, the second application may not be needed. Site fertility, crop age and vigor will affect applied nitrogen rates, and much research work needs to be done to characterize crop nutrition.

Pollination and Fruit Set

It has been reported that grafted trees may develop flowers as soon as the third season. Depending on vigor of the trees, a few fruit may be left on in years 3 and 4. As noted earlier, pollination can be difficult due to self-incompatibility and lack of pollinators. Though dead animal placement may attract pollinating flies and beetles, hand pollination using a flexible artist brush can work well in small orchard situations. Use the brush to transfer pollen grains from the anthers of one cultivar to the receptive stigma of another cultivar. Pollen is ripe when the anthers are brown, loose and crumbly, and the pollen comes off on the brush as a yellow dust. Stigmas are ripe when the tips of the pistils are green and glossy, and the anther ball in the same flower is still hard and green. Using this method, fruit set can be heavy, and care should be taken to not overload and stress the tree.

Pest Concerns

Pawpaws have few pest concerns. The peduncle borer (*Talponia plummeriana*) is a caterpillar pest that can bore into the pawpaw flower and cause it to drop. Though this damage is minor, in certain years the borer can destroy many flowers. Its presence should be monitored. Earwigs, slugs, San Jose scale and tent caterpillars have also been reported as occasional pests. Deer are not known to readily eat twigs or foliage, but bucks will use young trees to rub velvet from antlers in the fall.

The only disease reported on pawpaws is fly speck or greasy blotch (*Zygophiala jamaicensis*). This occurs during periods of high humidity. Dense foliage and lack of air movement contribute to the problem, so proper spacing and pruning should reduce the incidence.

Currently, with limited or no registered chemical options for pest control in pawpaw, "organic" methods are the only option.

Harvest and Post-Harvest Management

Depending on the cultivar, fruit can begin to mature in early August, and through first frost. Concentration of ripening fruit will also depend on cultivar, with harvest possibly spread out over the course of a month or within a few days. Ripe pawpaws develop a strong aroma that is both fruity and floral. When ripe, the fruit exhibits subtle visual clues, turning a lighter shade of green, and maybe showing some yellowing. The fruit will also begin to soften, similar to peach or avocado. In later stages, the fruit will yellow and develop brown blotches and streaks, eventually turning black like an over-ripe banana.

If allowed to stay on the tree, the fruit will reach a peak of ripeness, and then decline rapidly in quality. Fruit should be harvested as skin color begins the initial change for best storage and post-harvest longevity, even though flavor and sugar development may not be at a peak. Fully ripe pawpaws can be stored about a week in normal refrigeration, while less than fully ripe fruit may store for several weeks. Like a pear or peach, these fruit can be brought out to room temperature and allowed to ripen fully.

For fresh eating, the best method of pulp extraction is to cut the fruit in half and use a spoon to scoop out the flesh. The large seeds can be easily separated out. For cooking, the best recipes are those that require little or no heat. The flavor compounds are very volatile and heating will destroy the characteristic flavor.

Kentucky State University is the primary source for current information regarding pawpaw research, culture and marketing

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