

Pawpaw—A “Tropical” Fruit for Temperate Climates

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Contents

Introduction.....	1
Culture.....	1
Harvest and Postharvest Handling....	3
Marketing.....	3
Plant Extracts as Anti-carcinogens and Insecticides.....	3
Summary.....	4
References.....	4
Websites.....	4
Plant Sources.....	4

This publication is intended as a summary overview of pawpaw (or paw paw) production, including overall culture, pests, harvest, post-harvest, marketing, and research which seeks to develop the pawpaw’s potential for commercial development.

Introduction

The pawpaw (*Asimina triloba*) has great potential for commercial development. Though the pawpaw’s only near relatives are tropical and the pawpaw looks like a mango and tastes like a banana, it is not tropical but is native to most of the eastern U.S. and even into Canada. The pawpaw grows best in areas with hot summers and cold winters (USDA Zones 5-8). It is hardy and relatively pest-free, and its tolerance to shade makes it suitable for intercropping with other trees. In addition, the pawpaw has genetic variability that can be used to improve the plant.

A major research effort centered at Kentucky State University and involving a few other universities (including Cornell, Clemson, Purdue, Ohio State, Iowa State, and Oregon State) should contribute significantly to the commercial development of this crop (Pomper, et al., 1999). These universities have established identical plots of pawpaw cultivars, which they hope will identify the best cultivars and best management techniques. They are breeding for the following desirable traits: yellow to orange flesh; fruit size 10 ounces or larger; seeds small and few; fruit of uniform shape and free of external blemishes; and mild, sweet flesh with no unpleasant aftertaste.



"KSU-Atwood™" photo courtesy of Kirk Pomper, Kentucky State University.

Dr. Kirk Pomper at Kentucky State University (KSU) announced in 2010 the first release, ‘KSU-Atwood™’, from KSU’s pawpaw breeding program. With a flavor combining those of banana, pineapple and mango, ‘KSU-Atwood™’ shows promise as a commercially available cultivar (Kentucky State University Pawpaw Project).

Culture

Pawpaws thrive in moist, fertile, well-drained soils having a pH of 5.5–7.0. Although the pawpaw tolerates shade, it produces best in full sunlight, as long as it receives enough water and is protected from high winds. The trees will grow from 12 to 25 feet tall and should be spaced at least eight feet apart.

According to Dr. Pomper, weed control around trees, with straw or woodchip mulch, is important to increase tree survival rates. Pomper notes that voles that might be attracted to these mulches do not damage pawpaw trees as they would apple trees.

Planting: Seedlings vs. Grafted Trees

There are a number of cultivars that produce superior fruit. An unbiased description of most of these cultivars is available at Kentucky State University's pawpaw website: www.pawpaw.kysu.edu/reports.htm. Grafted trees of these named cultivars can be relatively expensive (up to \$35 for a single potted tree; wholesale quantities would presumably cost less per tree), so prospective growers might be tempted to plant ungrafted seedlings. While seedlings are much cheaper than grafted trees, there is so much genetic variability in the pawpaw that commercial-scale growers will be taking a significant gamble if they plant ungrafted seedlings, and they will not know the outcome of their bet for around 5-7 years since it can take that long for seedlings to begin bearing (grafted trees usually start bearing in 3-4 years).

Propagation by seed is quite slow but not difficult. Either plant the whole fruit after collection, or separate the seeds from the fruit and sow about an inch deep. Fresh pawpaw seed must be stratified (given a cold period). This can be done by holding the seed in refrigerated storage in plastic bags with moist peatmoss for at least four months and then sowing the following spring. If the seed is directly sown outdoors, it may take two cold periods before germination is initiated. Never dry the seed or freeze it; this will kill the seed.

If you live in an area where pawpaws grow wild, you might be tempted to transplant from the wild, but wild pawpaws have long taproots which are very easily damaged. Often pawpaw trees in wild patches are actually rootsuckers from the original tree with poorly developed root systems; these rootsuckers do not transplant well. Even nursery-grown pawpaws are ordinarily quite difficult to transplant. They have fleshy, brittle roots with very few fine hairs, which inevitably get damaged when transplanting. Experimentation has shown that, to be successful, transplantation should be done in the spring at the time that new growth commences or soon after. If many roots are lost, it may be desirable to prune the top to bring it into balance with the remaining roots.

Pollination

The slightly foulsmelling flowers are fly pollinated, and that may be one of the reasons that fruit set is so inconsistent in the wild. An old recommendation to hang road kill in your trees to attract fly pollinators (Black, 2009) might actually be helpful if you have only a few trees, but Sheri Crabtree at Kentucky State University says that hand pollination is probably more effective...and less objectionable. She also offered that at Kentucky State's relatively large research orchards, pollination has not been a major issue, probably because the presence of so many trees is simply that much more attractive to pollinators. More detail about hand pollination of pawpaw is available at a Virginia Cooperative Extension website <http://pubs.ext.vt.edu/438/438-105/438-105.html>.

Pests and Diseases

Pawpaws have very few pest problems. There are a few lepidopteran pests (caterpillars), the principal one being the pawpaw peduncle borer. The peduncle borer (*Talponia plummeriana*) burrows into the pawpaw flower and causes it to drop. Usually, however, so little damage is done that this is not a serious problem.

Other reported pests include earwigs, slugs, San Jose scale, and tent caterpillars. To discourage earwigs and slugs, Ray Jones, a California pawpaw grower, ties a three-inch band of aluminum foil around each trunk and paints the middle two inches of the foil with Tanglefoot® (Pyle, 1992). San Jose scale can be controlled with dormant oils. Tent caterpillars can be physically removed from the tree by cutting out the "tent" or the branches holding the tent.

Phyllosticta and flyspeck or greasy blotch (*Zygothiala jamaicensis*) can be problems of pawpaw. This occurs only during periods of high humidity and frequent rainfall. Dense foliage and lack of proper ventilation contribute to this condition, so proper spacing and pruning can reduce it. Phyllosticta can infect the leaves and the surface of the fruit; it can cause the fruit to crack when it expands and destroy it.

Harvest and Postharvest Handling

Pawpaws ripen very quickly and bruise easily, which limits shipping time. Though the fruit of some cultivars will exhibit a slight color shift from green to yellow, Dr. Pomper's research shows that skin color is a poor indicator of ripeness. Pomper claims that the best indicators are a slight softness when gently squeezed and the ease with which the fruit releases from its stem when gently pulled. Fruits picked just before they are fully ripe, but have begun to soften, will ripen indoors at room temperature or slowly in a refrigerator. Already ripe fruit will last only 2 to 4 days at room temperature, but refrigerated fruit will last up to 3 weeks. Research is being conducted to determine the effectiveness of using modified-atmosphere shipping and ethylene control sachets to extend shelf life (Galli, 2007).

Pawpaws are not suited for certain value-added products like jams and jellies. Heating pawpaws changes their flavor, so pawpaws would be best used in foods such as ice cream. Recipes using pawpaws are available from several sources, including the Kentucky State University website (www.pawpaw.kysu.edu/Recipes.htm).

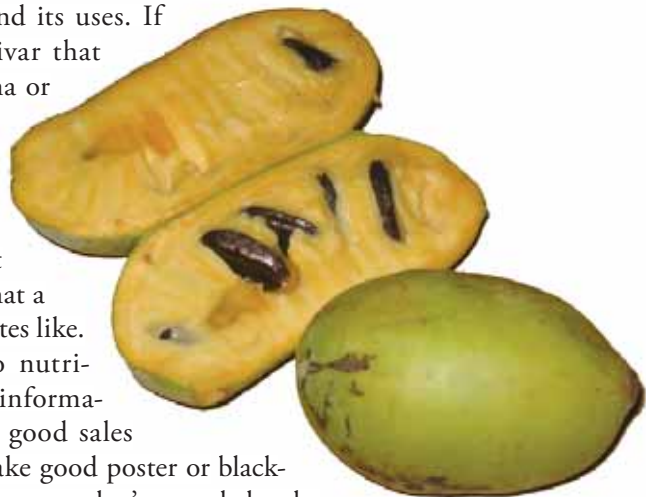
Iowa State scientists are researching mechanical pulp extraction and freezing techniques. Because cooking destroys important flavor components, and shelf-life of fresh pawpaws is so limited, such research could be crucial to the commercialization of the pawpaw (O'Malley, 2010).

Marketing

Given the fragility and short shelf-life of the fruit, the uncertain status of processing pawpaw pulp, as well as the simple novelty of the fruit itself, the enterprising pawpaw marketer should have a good sales plan before hitting stores, restaurants, or farmers markets. Careful handling, of course, is a must because the fruit is so easily bruised. There are a few commercial-scale growers in Kentucky and Ohio leading the way, including one who successfully processed and sold 1,000 pounds of pulp in 2009 (Ohio Pawpaw Growers Newsletter, 2009).

Beyond that, the pawpaw marketer would be well-advised to have some printed material (posters or hand-outs) to acquaint the consumer

with the fruit and its uses. If you have a cultivar that tastes like banana or mango or custard, tout that in a very visible way since most consumers won't have any idea what a good pawpaw tastes like. Because it is so nutritious, nutrition information might be a good sales tool, and can make good poster or black-board text as long as you don't overwhelm the reader with too much (shoppers are at stores or farmers markets to shop, not read; emphasize the high points: one of the highest protein content of any fruit; high in potassium, vitamin C, riboflavin, etc.; see www.pawpaw.kysu.edu/pawpaw/cooking.htm#Nutritional%20Information for more detailed nutrition information). Lastly, recipes to take home can be another inducement for the consumer to make that first purchase of a new food. Go to www.pawpaw.kysu.edu/Recipes.htm for recipes. The Ohio Pawpaw Growers Association (www.ohiopawpaw.com/AboutUs.html) has many members from around the country. This organization can also help individuals in pawpaw marketing efforts.



NCAT photo by Robyn Metzger.

Plant Extracts as Anti-carcinogens and Insecticides

Dr. Jerry McLaughlin, now retired, of Purdue University found that pawpaw was a source of phytochemicals called acetogenins with powerful anti-carcinogenic properties ("Pawpaw shows promise in fighting drug resistant tumors," 1999). An herbal extract made from pawpaw is on the market. For more information on pawpaw as an anti-carcinogen go to www.pawpawresearch.com

Dr. McLaughlin also isolated a botanical insecticide, asimicin, from pawpaw twigs and bark ("Pawpaw those pests," 1999); however, without financial backing to shepherd it through the regulatory process, it is unlikely to be on the market anytime soon (Bratsch, 2009).

Summary

Pawpaws may be a viable enterprise for small-scale farmers who can develop a local clientele. However, the amount of time that must be invested before the first fruit crop (five years or longer) is a deterrent to many would-be producers. The ongoing university research should answer many of these questions regarding cultivars, culture and processing/marketing.

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Frankfort, KY 40601-2355
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Pawpaw those pests. 1999. Organic Gardening. October. p. 16

Websites

Kentucky State University Pawpaw Research Project
www.pawpaw.kysu.edu

Provides information on pawpaw research, guide to growing pawpaws, cultivars, suppliers, PawPaw Foundation, and links to other pawpaw Web sites.

Purdue University's facts sheet on pawpaws
www.hort.purdue.edu/newcrop/cropfactsheets/pawpaw.html

Includes production information and suppliers

California Rare Fruit Growers' information on pawpaw
www.crfg.org/pubs/fff/pawpaw.html

Virginia Cooperative Extension
<http://pubs.ext.vt.edu/438/438-105/438-105.html>

Ohio Pawpaw Growers' Association
www.ohiopawpaw.com/AboutUs.html

Plant Sources

Blossom Nursery
Mark and Kathleen Blossom
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www.blossomnursery.com

Cultivars: KSU-Atwood™ and Superior Seedlings

Nolin River Nut Tree Nursery
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Upton, KY 42784
(270) 369-8551
john.brittain@windstream.net
www.nolinnursery.com

Cultivars: KSU-Atwood™, Allegheny, Potomac, Rappahannock, Shenandoah, Susquehanna, Wabash, Davis, Green-river Belle, IXL, Mitchell, NC-1, Overleese, PA Golden, Prolific, SAA-Zimmerman, Sue, Sunflower, Taylor, Wells. Bareroot (1' - 6')

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Seedling. Container (1 gal), and KSU-Atwood™

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Cultivars: KSU-Atwood™, Davis, Mango, Mitchell, NC-1, Overleese, PA Golden, Prolific, Sunflower, Sweet Alice, Taylor, Taytwo, Wells, Wilson, seedlings



"KSU-Atwood™" photo courtesy of Kirk Pomper, Kentucky State University.

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