



Appropriate Technology Transfer for Rural Areas

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PAWPAW PRODUCTION

HORTICULTURE PRODUCTION GUIDE

ATTRA is the national sustainable agriculture information center funded by the USDA's Rural Business -- Cooperative Service.

Abstract: *This publication is intended as an overview of pawpaw production, both for the fruit and for bark extracts that can be used as an insecticide. It focuses on overall culture, research, pests, harvest and postharvest, and markets. Enclosed lists provide information on named cultivars and plant suppliers.*

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INTRODUCTION

The pawpaw (*Asimina triloba*) has great potential for commercial development. The founder of the PawPaw Foundation, Neal Peterson, believes that pawpaws could be the next big domesticated fruit success.

Pawpaws are widely adapted and can be grown from Zone 5 to Zone 8, east of the Plains, with at least 32 inches of precipitation per year. The pawpaw grows best in areas with hot summers and cold winters. 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.

Despite its potential, several factors have discouraged development of the pawpaw as a commercial crop:

- Fruit set in nature is restricted due to poor pollination. The pawpaw generally requires cross-pollination, which may be limited because the plant blooms in early spring before many insects are active. One grower,



Illustration courtesy of
 California Rare Fruit Growers Association

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J.S. Akin (1), has found that one important pollinator is the bluebottle fly, which is attracted to the scent of carrion. He says that in order to improve pollination, some people will hang "road-kill" in the orchard. If the flower is properly pollinated, fruit set is good.

- Pawpaw fruit deteriorate rapidly after ripening.
- The fruit is highly variable: it can be very sweet or not at all, vary in size from 4 to 17 ounces, have many seeds or a few small ones, and can be produced anywhere from mid-August to October.
- Trees will not fruit before they reach 5 years of age.



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A major cooperative research effort among 14 U.S. universities began in the spring of 1994 and should contribute significantly to the commercial development of this crop. These universities have established identical plots of pawpaw cultivars, which they hope to evaluate to determine the best cultivars and best management techniques (2).

CULTURE

Pawpaws thrive in moist, fertile, well-drained soils having a pH of 5.5–7.0, with 6.4 being optimal. Although the pawpaw tolerates shade, it produces best in full sunlight, as long as it receives enough water and is protected from high winds. During the first two years of growth, however, pawpaw seedlings need shade (3). The trees will grow from 12 to 25 feet tall and should be spaced at least eight feet apart.

There are a number of cultivars that produce superior fruit. See the listing attached to this document for descriptions of cultivars currently found in the nursery trade.

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 vernalized (given a cold period). This can be done by holding the seed in refrigerated storage 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. Named cultivars started from seed are about 80% true to the parent plant, so grafting or budding may be unprofitable. Propagation from root cuttings is not usually successful.

Traits to Consider When Selecting Pawpaws for Genetic Improvement (4)	
Trait	Optimum
Flesh color	Yellow to orange
Fruit size	10 ounces or larger
Seediness	Seeds the size of a nickel and less than 12 per fruit
Flavor & quality of flesh	Mild, sweet, smooth texture with no unpleasant aftertaste
Appearance	Skin relatively free of blemishes; fruit uniformly shaped
Storability	Fruit lasts two to three weeks in refrigerated storage
Time of ripening	Mid-September to mid-October
Winter hardiness	Plant should overwinter in Zone 5

Transplanting from the wild is problematic because roots are easily damaged. Container-grown trees, however, transplant well, although they can be quite expensive (as much as \$25 at retail nurseries). Another problem with container-grown trees is the restricted taproot and resultant stunting. Using long, narrow pots can alleviate this problem.

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® (5). 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.

The only disease reported on pawpaw is flyspeck or greasy blotch (*Zygophiala jamaicensis*). This occurs only during periods of high humidity. Dense foliage and lack of proper ventilation contribute to this condition, so proper spacing and pruning should eliminate it.

HARVEST AND POSTHARVEST

Pawpaws ripen very quickly and bruise easily, which limits shipping time. When fully ripe, the pawpaw skin turns from greenish yellow to brown or black. Fruits picked just before they are fully ripe will ripen indoors at room temperature or in a refrigerator (6). Already ripe fruit will last only two days at room temperature, but refrigerated fruit will last about a week. Research is being conducted to determine the effectiveness of using modified-atmosphere shipping and ethylene control sachets to extend shelf life.

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 PawPaw Foundation (7).

BARK EXTRACTS

Pawpaw bark is known to have insecticidal properties. Dr. Jerry McLaughlin (8) of Purdue University is co-inventor of the process to isolate the pawpaw's primary insecticidal component, asimicin. Dr. McLaughlin is convinced of the efficacy and safety of asimicin.

Dr. McLaughlin believes those twigs a quarter inch or less in diameter are better sources of asimicin than the bark. So, coppicing or pollarding trees, rather than harvesting whole trees or bark from trees, would be the preferred method to harvest pawpaw for insecticide production. Mark Blossom (9) of The Pawpaw Project is encouraging farmers to plant pawpaws for "biomass" production in anticipation of a pawpaw insecticide industry.

However, asimicin will probably not be on the market anytime soon. Dr. McLaughlin is having difficulty finding an industry patron with the willingness and money to steward asimicin through the EPA registration process. The National Cancer Institute funded his initial research (asimicin is also an anticarcinogen), but the estimated \$10 million to get a new chemical registered is within the reach of established agrochemical manufacturers only.

The powdered bark or twig tissue is an effective insecticide; it is not necessary to isolate the asimicin. To be effective, the fineness of the grind should approach talc consistency. Blossom has said that crudely chopped material could be sent to an herb processor for custom-grinding to whatever fineness is desired. These bark dusts have proved effective against squash bugs, cabbageworms, bean leaf beetles, and striped cucumber beetles (10), but to date, only cursory interest has been shown. The USDA and EPA cannot prevent farmers or gardeners from using such a product on food for their own consumption (McLaughlin uses it in his own garden), but food treated with pawpaw dust would probably be subject to regulations preventing its sale. Asimicin and the unprocessed powder cause vomiting when ingested by most animals including humans. McLaughlin feels that this provides a unique and important safety factor in asimicin's favor; however, he noted that the EPA has no procedure to acknowledge such safety characteristics.

SUMMARY

Pawpaws may be a viable enterprise for small-scale farmers who have acquired a local market. 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. Very little is yet known about pollinators and expected yields. The ongoing research at land-grant universities should answer many of these questions.

References:

- 1) J.S. Akin
P.O. Box 6
Sibley, LA 71073
318-377-3653
- 2) Anon. 1994. Multi-state research begins on the pawpaw. *Growing for Market*. April. p. 10.
- 3) Barrett, Thomas. 1994. The pawpaw. *Small Farm Today*. April. p. 55-56.
- 4) Callaway, M. B. 1990. The pawpaw (*Asimina triloba*). Kentucky State University Publication CRS-HORTI-90IT. 22 p.
- 5) Pyle, Katherine. 1992. Picking up pawpaws...and growing them, too. *California Rare Fruit Growers, Inc.* December. p. 24-25, 35-36.
- 6) Reich, Lee. 1992. Pawpaws have potential. *Fruit Grower*. April. p. 30-31.
- 7) The PawPaw Foundation
147 Atwood Research Facility
Kentucky State University
Frankfort, KY 40601-2355
<http://www.pawpaw.kysu.edu/>
- 7) Dr. Jerry McLaughlin
Dept. of Medicinal Chemistry
and Molecular Pharmacology
Purdue University
West Lafayette, IN 47907
765-494-1403
- 9) Mark Blossom
The Pawpaw Project
Rt. 1, Box 682
Eureka Springs, AR 72632
501-253-7895
- 10) Anon. 1989. Pawpaw those pests. *Organic Gardening*. October. p. 16.

Enclosures:

Jones, Snake and Desmond R. Layne. 1998. Pawpaw cultivars and grafted tree sources. 4 p.
<http://www.pawpaw.kysu.edu/pawpaw/cvsrc98.htm>

Anon. No date. Pawpaw tree and seed sources. 8 p.
<http://www.pawpaw.kysu.edu/pawpaw/nurslst.htm>

Additional Resources:

The PawPaw Foundation
147 Atwood Research Facility
Kentucky State University
Frankfort, KY 40601-2355
<http://www.pawpaw.kysu.edu/>
*The PawPaw Foundation invites new members.
Annual dues are \$20.*

The Pawpaw Tracker's Newsletter
Ray Jones, editor
783 Cornell Drive
Santa Clara, CA 95051
\$5 for the first year, \$2/year after that

Web Sites:

<http://www.pawpaw.kysu.edu/>
Kentucky State University Pawpaw Research Project;
provides information on pawpaw research, guide to
growing pawpaws, cultivars, suppliers, PawPaw
Foundation, and links to other pawpaw web sites

[http://www.hort.purdue.edu/newcrop/Crops/
CropFactSheets/pawpaw.html](http://www.hort.purdue.edu/newcrop/Crops/CropFactSheets/pawpaw.html)
Purdue University's facts sheet on pawpaws; includes
production information and suppliers

<http://www.crfg.org/pubs/ff/pawpaw.html>
California Rare Fruit Growers' information on
pawpaw

The electronic version of Pawpaw Production
is located at:
<http://www.attra.org/attra-pub/pawpaw.html>

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