Asimina triloba (L.) Dunal

Annonaceae

LOCAL NAMES
English (Hoosier banana,aciminier,fetid-shrub,pawpaw-apple,false banana,dog banana,custard apple,Indiana banana,American custard apple,West Virginia banana,prairie banana,Michigan banana,pawpaw,Kentucky banana,poor man's banana)

BOTANIC DESCRIPTION
A. triloba is a small deciduous understorey tree, up to 9 m tall. Grown in full sun, the pawpaw tree develops a narrowly pyramidal shape with dense, drooping foliage down to the ground level. In the shade it has a more open branching habit with few lower limbs and horizontally held leaves.

Leaves large, green, simple, alternate 17.8-25.4 cm long, elliptical to oblanceolate, spread out in umbrella-like whorls, entire, and papery, emit a strong tomato or green pepper smell when crushed.

Flowers cup-shaped, up to 5 cm wide, first green, turning deep reddish-purple (3 green sepals and 6 purple petals in two tiers), not showy but fragrant. The species name, triloba, refers to the calyx (the outer most flower whorl, made up of the sepals), which consists of three triangular-shaped sepals.

Fruit oblong, large edible berry, 5-16 cm long and 3-7 cm wide, weighing 20-500 g, with numerous seeds; green when unripe, maturing to yellow or brown, aromatic, the yellow pulp soft and sweet, blending the flavors of banana and custard with a lovely texture reminiscent of the avocado.

Twigs stout with naked red-brown hairy buds.

Bark thin, smooth, dark brown, often with gray blotches and small wart-like projections on older trees.

BIOLOGY
Pawpaw flowers are perfect, but not self-pollinating requiring cross pollination from another unrelated pawpaw tree. Pollination is by blowflies and carrion beetles which are not efficient and dependable causing poor fruiting.

The bloom period is about 6 weeks during March to May (spring) followed by the fruit in summer. The fruit ripens between mid August into October during with harvesting is done. It reproduces clonally and less often from seed, forming patches in the understory.

Seeds (Steve Hurst. Provided by ARS Systematic Botany and Mycology Laboratory. Castleman Ferry, VA.)

The bole (©J.S. Peterson. USDA NRCS NPDC. USDA ARS National Arboretum, Washington, D.C.)

flowers (Wendy VanDyk Evans, , www.forestryimages.org)

ECOLOGY
A. triloba is a tree of temperate humid growing zones, requiring warm to hot summers, mild to cold winters and is almost always found in nature as an understory tree of rich broadleaf deciduous forests growing in bottomland areas, on wooded slopes, ravines, along streams and in marshy areas with deep, rich, damp, sandy, or clayey acidic soils and high rainfall.

Common tree associates include blackgum (Nyssa sylvatica), Ohio buckeye Aesculus glabra), honey locust (Gleditsia triacanthus), and coffee tree (Gymnocladus dioica)

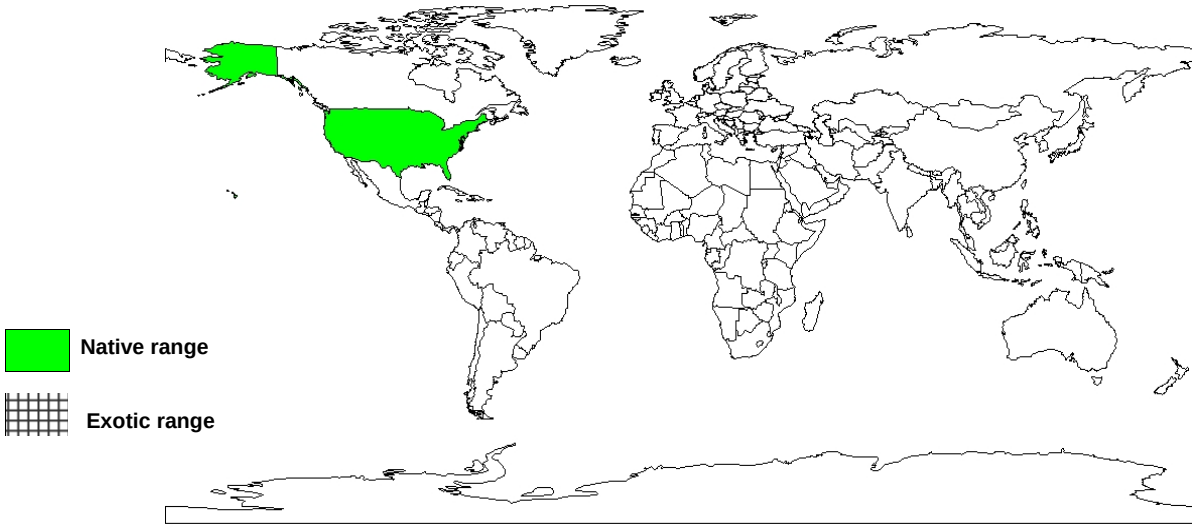
BIOPHYSICAL LIMITS
Temperature: hardy from -26o C to -9o C.

Rainfall: minimum of 810 mm of rainfall spread rather evenly throughout the year, with the majority falling in spring and summer.

Soil type: prefers a slightly acid soil (pH 5.5-7), deep, fertile, and well-drained. Pawpaws do not thrive in heavy or waterlogged soil.

DOCUMENTED SPECIES DISTRIBUTION

Native: US
Exotic:



The map above shows countries where the species has been planted. It does neither suggest that the species can be planted in every ecological zone within that country, nor that the species can not be planted in other countries than those depicted. Since some tree species are invasive, you need to follow biosafety procedures that apply to your planting site.

PRODUCTS
Food: Fruits are frequently eaten raw or used in ice creams or baked into pies, or made into dessert although they can cause nausea in some people. The unique flavor of the fruit resembles a blend of various tropical flavors, including banana, pineapple, and mango. The flavor and custard-like texture make pawpaws a good substitute for bananas in almost any recipe.

Pawpaws are very nutritious fruits. The fruit is particularly low in moisture content, high caloric content, high in vitamins A and C, magnesium, iron, copper, and manganese. They are a good source of potassium and several essential amino acids, and contain significant amounts of riboflavin, niacin, calcium, phosphorus, and zinc. Pawpaws contain these nutrients in amounts that are generally about the same as or greater than those found in bananas, apples, or oranges.

Medicine: The seeds of the Pawpaw contain an alkaloid, asiminine, which is reported to have emetic properties. The fruit is used as a laxative, leaves are diuretic, and are applied externally to boils, ulcers and abscesses. The seed contains the alkaline asiminine, which is emetic and narcotic. They have been powdered and applied to hair to kill lice. It has also been used in homeopathy as a remedy for scarlet fever and red skin rashes. The bark is a bitter tonic and contains the alkaline analobine, which is used medicinally. The Pawpaw made headlines in 1992 when a Purdue University researcher reportedly isolated a powerful anti- cancer drug, as well as a safe natural pesticide from the Pawpaw tree. The substances are said to be primarily found in the twigs and small branches, and is among the most potent and least toxic anti-cancer agents currently known.

Pesticide: White waxy compound highly concentrated in the bark, twigs, fruit, seeds has insecticidal properties and has been used to poison pests.
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Fibre: The thin fibrous inner bark has been used in making strong ropes, strings and fish nets

Dye: A yellow dye is made from the ripe flesh of the ripened fruit.

SERVICES
Forage: Wildlife (e.g., gray fox, raccoons, squirrels, opossums and birds) eagerly seek out the fruits and often beat humans to the harvest.

Ornamental: Pawpaw can be planted as an ornamental, particularly where clusters of small trees are desired.

Border: it can be planted as a shrub border or woodland margin, and is effective around damp areas and along ponds or streams.

TREE MANAGEMENT
Recommended tree spacing is 5.5 m between rows and 2 m within the row. Row orientation should be north-south. Pawpaw trees require adequate soil moisture, especially in the first two years after planting. Newly planted trees should be watered as needed throughout the growing season. Newly planted trees require temporary partial shade to reduce transplant shock. Once established, pawpaws prefer full sun. Application of a balanced fertilizer (20N-20P-20K) every few weeks during the first half of the growing season may improve growth and establishment of young trees.

Pruning is little required, except to remove dead, damaged or wayward branches. Periodic pruning may be used to stimulate some new growth each year on older trees, since it is new growth that produces fruit the following season.

Home gardeners can ensure pollination by hand pollinating using a small, soft artist's brush to transfer pollen to the stigma. For commercial plantings road kill could be hang on trees to attract flies to ensure pollination.

Ripe pawpaw fruits are easily picked, yielding to a gentle tug. Shaking the tree make them fall off. The ripe fruit is very perishable with a shelf life of 2-3 days, but will keep up to 3 weeks if it is refrigerated at 4-7° C.

GERMPLASM MANAGEMENT
Seeds should not be allowed to freeze or dry out, because this can destroy the immature, dormant embryo. To break dormancy Pawpaw seed must receive 90-120 day stratification, i.e. exposure to cold temperatures. To accomplish this, the seed should be placed in plastic freezer zipper bag containing a handful of moist sphagnum moss and refrigerated at 0° - 4° C. The over wintering of field planted seeds normally accomplishes this stratification requirement.

PESTS AND DISEASES
Pawpaw trees are relatively disease free. In its native habitat few pests exist, the most important being Talponia plummeriana, the pawpaw peduncle borer. Another pest is Eurytides marcellus, the zebra swallowtail butterfly, whose larvae feed exclusively on young pawpaw foliage but never in great numbers.

Male deer occasionally damage trees by rubbing their antlers on them in winter. The attraction of pawpaw roots to gophers is somewhat unknown, but it's likely that they would not be the gopher's first choice. Slugs, snails and earwigs can be easily controlled by the application of Tanglefoot to a band around the pawpaw tree trunk. It is important not to apply Tanglefoot directly to the bark, however.

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