# OSAGE-ORANGE (Maclura pomifera): An American Traveler

by Dr. Kim D. Coder, University of Georgia 8/99

Osage-orange (Maclura pomifera) is a small tree in which people have found great value. Once discovered by early European settlers, it was carried and tended across the continent. Because of its attributes, it was prized anywhere agriculture and grazing animals were found. It is now considered escaped from cultivation and has naturalized in many areas. Solitary trees or small family groups can be found on old home sites, in alleys, and along roadways.

## Names & Relatives

Osage-orange is not a citrus or an orange tree, and so its name is hyphenated. Osage-orange is known by many common names in all the places that it grows. Many of the names represent specific uses of the tree which included wood for long bows and shrubs for field hedges. Common names include bois-d'arc, bodark, bodock, bowwood, fence shrub, hedge, hedge-apple, hedge-orange, horse-apple, mockorange, naranjo chino, and postwood. The scientific name (Maclura pomifera) is derived from William Maclure, an American geologist working around 1800, and the Latin term for apple-fruit bearing.

Osage-orange is the only species in its genus, called a monotype. It is a member of the mulberry family (Moraceae), which contains mulberries and figs. The mulberry family has 73 genera and more than 1500 species, most of them tropical. All the family members, including osage-orange, produce a bitter, milky sap which contains latex. The most closely related species to the osage-orange is in the genus Chlorophora from tropical America and Africa.

## History of Use

The historic uses of osage-orange followed the path of European settlement on this continent and the rise of traditional agriculture. The first uses recorded were from native Americans (the Osage tribe) in the Red River Valley area of Oklahoma. The Osage used osage-orange for bows, tool handles, and war clubs. Early trappers, frontiersmen, and explorers recognized the tough, dense wood as ideal for their own archery bows and handles.

The first planted uses were for animal corrals and field hedges. The dense growth as a shrub, the tough wood, and the short, sharp thorns together proved effective controlling domestic grazing animals. It is suggested that barbed wire was inspired by the spiny osage-orange. Except in bad years, animals would not graze the spiny, bitter-tasting, tough twigs and foliage. The rubbery fruits were poorly digestible and bitter tasting with their milky sap.

The extremely durable and decay resistant heartwood was used for wheel hubs, fence posts, and railroad ties. The bark could be used for leather tanning and extracting (principly from root bark) a yellow tannin (hot water soluble) dye for clothes and baskets. The fruits and sap were used as a pesti-



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cide. The wood was so hard and dense it was difficult to cut and work. With difficulty the wood could be gathered for firewood. With its density, it burned more like coal than other lighter woods, requiring a coal grate inside a stove.

## Native Range

One of the botanical mysteries of this continent is identifying the native growing range of osage-orange. The historic native range is unclear because is was moved and planted extensively before detailed botanical surveys were conducted. It quickly escaped cultivation and started to reproduce and thrive (naturalized) in many new locations across the continent.

The commonly accepted native range for osage-orange is the three state area of southwest Arkansas, southeast Oklahoma, and northeast and east Texas. It seems to have reached the height of it reproductive success ecologically in open, rich bottom-land forests centered around the Red River valley of Oklahoma. Newly revealed or deposited mineral soil, plenty of water, and few competitors made for good germination and growth.

Today, osage-orange can be found naturalized south of the Great Lakes and north of Florida, across the whole of eastern North America into the great plains states almost to the Rocky Mountains. Additional naturalized populations are present along Western settlement trails, forts, and settler locations in the pacific northwest. Osage-orange has been bundled and dragged across the nation -- east to west -- north to south -- because of its uniqueness and utility.

## Description

Osage-orange is a small, deciduous, and dioecious (each stem is either male or female) tree or large shrub with low, crooked branches and a coarse-textured appearance. Usually osage-orange is a multi-stemmed shrub if grown in full sun without any competition. Neighboring competition from the side can generate a single-stemmed tree. The stem is usually short with many thick branches producing a rounded crown. With age, the tree and branch connections can develop a thick, gnarled appearance.

Average height is around 30-35 feet (65 feet maximum). Average spread is 25 feet (60 feet maximum). Stem diameter averages 1.5 feet DBH (6 feet maximum). Osage-orange is a surprising rapid growing tree but has a relatively short life-span (around 75 years). It has reached its maximum size and age characteristics outside its native home range on fertile, moist soils. It has been found to be ideal for many stressful sites, such as along city street and in parking lots.

## Leaves

The leaves of osage-orange are simple in form, alternating along twigs, entire margined, thick and shiny. Leaves tend to be clustered on stubby, spur-like twigs. The leaves are 3-6 inches long with a long tapering and pointed tip. Leaves are 2-3 inches wide with a rounded leaf base. A 1.5 inch long, milky-sap-oozing, slender petiole connects leaves to twigs. Leaf color is a dark shiny green on top and a light green color on the underside. In fall, osage-orange is known for its bright yellow senescence coloration.

## Crown & Twigs

When viewed as a whole tree, osage-orange has an open, rounded crown composed of thick, spreading, curved branches. Any sprouts present are long and slender. Twigs tend to have a zig-zag pattern. Marginal branches do not self-prune well and add to the coarseness and untidiness of the crown.

Upon closer inspection, twigs have a zig-zag form with straight internodes between lateral buds and an aborted terminal bud. The twigs contains a milky juice. Twigs are thick, stiff, smooth and orange-brown in color. There is a sharp, straight, unbranched thorn, ½ to 1 inch in length present in most

leaf axils (petiole / leaf connection). Thorn length decreases toward the twig tip. Marginal branches (for example -- in heavy shade) may not produce thorns at all. There are small, brown, round, lateral buds which appear partially embedded (sunken) in the bark to the side of each thorn.

One natural thornless variety (Malclura pomifera inermis), and a number of thornless cultivars (Wichita and White Shield are the most thornless) are available in the nursery trade. The cultivars are male selections to eliminate fruit problems. Osage-orange has a tetraploid genetic system. It has been found to hybridize with Cudrania tricuspidata.

Bark & Roots

Mature osage-orange bark is 3/4 inches thick, with deep, irregular furrows between rounded ridges. Bark has an orange-brown color with brighter colors in the furrow bottoms. The inner root bark is an orange color while the inner stem bark is a yellow-orange color. The bark peels in thin strips.

Osage-orange has a wide-spreading, opportunistic root system. Fibrous absorbing areas can be generated quickly to take advantage of resource availability. The roots grow is fast. A well developed juvenile tap-root is present. Many large, woody transport roots spread from the root crown. A high concentration of several protective materials are concentrated in the root bark.

Flowering & Fruiting

Flowering in osage-orange is dependent upon photoperiod and other environmental conditions. Osage-orange is a dioecious tree -- having male and female flowers on different trees. Flowers on both sexes are small, green, and inconspicuous. Flowers appear from April to May after the leaves have expanded. The flowers are wind pollinated. Some people are specifically allergic to osage-orange pollen.

Probably the most noticeable feature of osage-orange is the fruit produced by female trees. The fruit is round, 3-5 inches in diameter, and yellow-green in color. It resembles a large orange or a monstrous round mulberry. The fruit is a dense round aggregate (cluster) of many one-seeded drupelets (average 300 seeds per fruit). The fruit is produced every year, ripens in September and falls to the ground. Fruit weight prevents natural dissemination except where animals move and cache fruits, or where flood waters wash fruits downstream.

Osage-orange trees are usually sexually mature by 8-12 years of age and fully productive as fruit-bearers by 25 years of age. Maximum fruiting age is around 75 years. Female trees will produce fruit without the presence of a male tree, but no viable seeds will be present.

The fruits are pulpy, dense, and heavy with a high moisture content concentrated in a milky, bitter, latex-containing juice (or sap). Young green-colored fruit ripen and mature to a yellowish-colored mature fruit with a rubbery, bumpy rind. The rind is composed of the exterior ends of individual seed sacks. The fruit has little ecological value as a food source until it has aged and broken apart. Few animals consume the fruit or seeds. The latex-containing milky sap acts as a digestive irritant to domestic animals and fruit are not eaten unless nothing else is available.

Wood

The wood of osage-orange is as unique as the rest of the tree. The heartwood is extremely decay resistant, dense, tough, and bright orange. Osage-orange is the densest and most decay resistant wood in North America. Osage-orange is ring-porous. Osage-orange wood characteristics have provided for many local / folk uses. It is principally known for long effective-life fence posts when the bark is removed. Fence posts were cut on a 15 year rotation with fruits planted along the fence row every year to lengthen the living fence. Fence posts cut and immediately installed without bark removal can occasionally sprout and regenerate a root system.

Osage-orange is most visible as components or sole-species in windbreaks and shelter-belts. It generates dense living barrier plantings and security fences, if maintained. The wood is still prized for specialty products such as hand-crafted archery bows, knife handles, and craft dyes extracted from the heartwood and root bark. Locally the wood is "chunked" for seasonal burning in coal-burning stoves. Wood density, toughness, and drying problems prevents most traditional lumber uses.

## Growing Trees

To successfully collect seeds and grow seedlings, it is critical that you locate fruiting females with several neighboring males. Fruits can be collected from the ground anytime after they fall until just before Spring. The milky juice in the fruit serves as a dormant season pesticide in protecting the seeds from damage. The seeds should be removed from the pulp by aging in a cool moist location and/or mechanically cleaning. The more aging that occurs, the easier cleaning becomes. Do not ferment the fruits to assist in seed removal. Avoid prolonged skin contact with the milky juice.

Osage-orange seeds have a short-duration dormancy factor which is removed by a moist, cool period (30 days), or soaking in cool water for 48 hours. Expected germination is 50% of seeds within 30 days. Sow the seeds 3/8 inch deep and firm soil. For fall sowing, sow cleaned but otherwise untreated seeds in mineral soil and then use a light organic mulch over the top. For Spring sowing, sow cool-treated seeds in mineral soil without mulch. Seeds require mineral soil contact, full sunlight, and moist conditions. Seeds can be stored for several years if cleaned and kept under dry, cool conditions.

## Stress Concerns

Osage-orange has few pests and, once established, can handle a variety of site / soil constraints. On resource-rich sites in full sun, osage-orange can grow fast. A major concern in growing young trees is elimination of both herbaceous and woody competition. Osage-orange is considered hardy to non-fluctuating winter temperatures found up to winter hardiness zone 5. Within its native range, osage-orange is attacked by Phymatotrichum omnivoum -- cotton root rot. In addition, osage-orange has been attacked by leafy mistletoe, Verticillium wilt, assorted leaf spots, Pythium root rot, stem borers, scale, and rodents. Osage-orange is not attacked by subterranean termites.

## Conclusions

Osage-orange is an unique tree found in abandoned areas and unexpected places. It represents a long American story of planting, transport, use and survival in new locations. Osage-orange is a stress-tolerant tree almost unknown and unused in communities, but readily found in many locations. Osage-orange could function as an effective shade and street tree.

## Selected Readings


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