

Maclura pomifera (Raf.) Schneid.

Osage-orange

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Synonym. *Toxylon pomiferum* Raf. ex Sarg.

Other common names. bois-d'arc, bodark, bowwood, hedge, horse-apple.

Growth habit, occurrence, and uses. Osage-orangeCM*Maclura pomifera* (Raf.) Schneid. Cis native to bottomlands of southern Arkansas, southeastern Oklahoma, and eastern Texas. It is most abundant in the Red River Valley of Oklahoma but was widely planted in all 48 conterminous states and southeastern Canada as Aliving fences@ on the treeless prairies during the mid-1800's and has now naturalized in many of these locations (Burton 1990; Little 1979; Sargent 1965). Osage-orange is a small deciduous tree chiefly valued for posts and windbreak plantings. Fruits have some value as wildlife food. A typical height at maturity is 9 m, but some individuals have grown to 21 m.

Flowering and fruiting. The small, green, dioecious flowers open from April to June; they are wind-pollinated. The large, globose, yellow-green, aggregate fruit, or syncarp, is composed of many 1-seeded drupelets (figure 1). The fruits ripen in September and October and soon fall to the ground (Bonner and Ferguson 1974). Fruits reach diameters of 7.6 to 15 cm (figure 2) and often weigh more than 1 kg (Burton 1990). Trees bear fruits by age 10, and good crops occur annually (Bonner and Ferguson 1974). Female trees often produce abundant fruit when there are no nearby pollen sources, but these fruits do not contain seeds (Burton 1990).

Collection, extraction, and storage. Fruits should be picked up soon after they fall from the trees but can be collectioned throughout autumn and winter. Seeds may be extracted by macerating the fruits in water and floating off or screening out the pulp. Extraction and cleaning is easier if the fruits are allowed to ferment for several months before maceration. Fruits left in a pile outdoors until late March or early April become very soft and mushy and easy to macerate (Myatt and others 1991). Seeds extracted in this manner have a pronounced purple streak and pleasant fragrance, and they germinate promptly (Bonner and Ferguson 1974).

After extraction, the seeds should by air-dried and cleaned by screening to remove small pieces of fruit tissue. Common air-screen cleaners serve this purpose very well (Myatt and others 1991). Yield data from 22 scattered samples (Bonner and Ferguson 1974) are as follows:

No. of fruits per volume	227/hl	80 bu
No. of seeds per volume of fruit	70,000/hl	24,650/bu
Seed weight per volume of fruit	2.9kg/hl	2.25lb/bu
Cleaned seeds per weight		
Average	30,900/kg	14,000/lb

Range

15,400B35,300/kg 7,000B16,000/lb

Purity of 96% and soundness of 95% have been attained (Bonner and Ferguson 1974). Long-term storage data are lacking for Osage-orange, but good viability has been reported for clean air-dried seeds stored for 3 years in sealed containers at 5 °C (Engstrom and Stoeckler 1941).

Pregermination treatment and germination tests. Osage-orange seeds typically exhibit a slight dormancy that may be overcome by moist stratification for 30 days at 5 °C or by soaking in water for 48 hours (Engstrom and Stoeckler 1941). Fresh seeds extracted from rotted fruits are not usually dormant and need no pretreatment (Bonner and Ferguson 1974), but stratification or water soaking should probably be used on stored seeds or seeds dried to low moisture contents (10% or below). Tests have been made in flats of sand or soil with pretreated seeds for 40 days at 20 °C nights and 86 °C days. Average germination for 13 samples under these conditions was 58%. Germination rate was fair: 20 to 79% in 14 to 34 days (Bonner and Ferguson 1974). Germination may also be tested in incubators on paper media. Germination is epigeal (figure 3).

Nursery practice. Untreated seeds may be sown in the fall, but a pregermination treatment should normally be used before spring sowing. If seeds are freshly extracted from fruits that have been rotting overwinter, however, they have had a natural stratification and can be sown without further treatment. Seeds may be drilled in rows 20 to 30 cm (8 to 12 in) apart or sown in bands 7.5 to 10 cm (3 to 4 in) wide if single-row procedures are used. Seeds should be covered with 6 to 13 mm (3 to 2 in) of firmed soil. Fall-sown beds should be mulched, but not spring-sown beds (Bonner and Ferguson 1974). Recommended bed densities are 100 to 160 seedlings/m² (10 to 15/ft²) (Williams and Hanks 1976).

Osage-orange can also be propagated by softwood cuttings taken in June or by hardwood cuttings taken in January. Cuttings should be treated with indole butyric acid (IBA) at 5,000 or 10,000 ppm and placed in sand under mist (Dirr and Heuser 1987).

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Figure 1 *Maclura pomifera*, Osage-orange: aggregate fruits composed of 1-seeded drupelets, $\times .5$.

Figure 2 *Maclura pomifera*, Osage-orange: excised embryo and nutlets, $\times 6$.

Figure 3 *Maclura pomifera*, Osage-orange: seedling development after 1 and 3 days of germination.