CelastraceaeCStaff-tree family

Celastrus scandens L.

American bittersweet

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Other common names. climbing bittersweet, shrubby bittersweet.

Growth habit, occurrence, and use. American bittersweet is a deciduous climbing or twining shrub of eastern North America (Brizicky 1964; Fernald 1950) that occurs in thickets, in stands of young trees, along fence rows, and along streams, usually in rich soil. It occurs naturally from southern Quebec; west to southern Manitoba; and south to Oklahoma and central Texas, Arkansas, Tennessee, northern Alabama, and western North Carolina (Brizicky 1964). Some authors (Fernald 1950; USDA FS 1948*)* reported it in Louisiana, New Mexico, Georgia, and Mississippi, but its occurrence has not been verified in Georgia, Louisiana, or Mississippi (Brizicky 1964).

The plant is valuable for ornamental purposes and game food and cover; the bark has been used for medicinal purposes (USDA FS 1948). Among the animals and birds feeding on American bittersweet are the bobwhite quail (*Colinus virginianus*), ruffed grouse (*Bonasa umbellus*), ringneck pheasant (*Phasianus colchicus*), eastern cottontail (*Silvilagus floridanus*), fox squirrel (*Sciurus niger*), and various songbirds (Van Dersal 1938). It was introduced into cultivation in 1736 (USDA FS 1948).

By 1970, oriental or Asiatic bittersweetC*C. orbiculatus* Thunb.Chad become naturalized on at least 84 sites from Georgia to Maine and west to Iowa (McNab and Meeker 1987), occupying many of the same sites as American bittersweet. It is listed as an invasive plant by the United States Government (USDA NRCS 1999). In some locales, the species is found mainly along fence lines, resulting from the germination of seeds contained in the droppings from frugivorous birds (McNab and Meeker 1987). The stem, leaves, and berries of oriental bittersweet are reported to be toxic for human consumption (McNab and Meeker 1987).

Flowering and fruiting. The small greenish, polygamo-dioecious or dioecious flowers open from May to June and are borne in raceme-like clusters at the end of branches (Brizicky 1964; Fernald 1950). Hymenopterous insects, especially bees, seem to be the main pollinators, although wind may also be involved (Brizicky 1964). Seeds are about 6.3 mm long and are borne in bright orange to red, fleshy arils, 2 of which are usually found in each of the 2 to 4 cells composing the fruit, a dehiscent capsule (figure 1). The yellow to orange capsules ripen from late August to October. They split open soon thereafter, exposing the seeds covered with showy red arils (figures 2 and 3). Good seed crops are borne annually and may persist on the bushes throughout much of the winter (USDA Forest Service 1948). In Pennsylvania, only 1 seed crop failure was reported in a 14-year period (Musser 1970). Sunlight is reported necessary for abundant fruiting to occur (Musser

1970).

Collection of fruit. The ripe fruit should be collected as soon as the capsules separate and expose the arils, or from about mid-September as long as they hang on the vines (USDA FS 1948), but rarely later than December (Van Dersal 1938). In Pennsylvania, the fruits are collected from late October through November (Musser 1970).

Extraction and storage of seeds. Collected fruits should be spread out in shallow layers and allowed to dry for 2 or 3 weeks (USDA FS 1948). In Pennsylvania, the fruits are allowed to air-dry for 1 week in shallow trays (Musser 1979). The seeds are then removed from the capsules by flailing or running the fruits through a hammermill or macerator with water (Musser 1970; USDA FS 1948). Then the seeds are allowed to dry for another week and the chaff is separated by windmilling (Musser 1979). The dried arils are left on the seeds (USDA FS 1948) except when seeds are to be stored.

American bittersweet has 4 to 8 seeds/fruit. On the basis of 10 samples, the number of seeds per weight ranged from 26,000 to 88,000/kg (12,000 to 40,000/lb) with an average of 57,000/kg (26,000/lb). Average purity was 98% and average soundness 85% (USDA FS 1948).

In Pennsylvania, the seeds usually are sown in the fall soon after collection and extraction or stored in cloth bags until used (Musser 1970). For longer storage periods, viability has been retained for 4 to 8 years by cleaning the fleshy material from the seeds, air-drying the seeds at low humidity, and then storing them in sealed containers at a temperature between 1 and 3 °C (Heit 1967).

Pregermination treatments. Seeds of American bittersweet have a dormant embryo and thus require after-ripening for germination. There is also some evidence that the seedcoat may have an inhibiting effect on germination (Hart 1928; USDA FS 1948). Good germination is obtained by fall-sowing or by stratification in moist sand or peat for 2 to 6 months at 5 °C (Heit 1968; Musser 1970; USDA FS 1948). Three months of cold stratification has resulted in good germination for American bittersweet (Dirr and Heuser 1987). It seems to make little difference whether cleaned seeds or dried fruits are sown; however, it appears that both cleaned seeds and fruits should be dried at room temperature for 2 to 3 weeks before they are sown (USDA FS 1948).

Germination tests. On the basis of 6 tests, using stratified seed in sand flats, at temperatures alternating from 10 to 25 °C, germinative capacity was found to range from a low of 9 to a high of 80% in 30 days, with an average of 47%. Potential germination varied from 9 to 93% (USDA FS 1948). Seed of oriental bittersweet showed 100% germination after 3 months of cold stratification (Dirr and Heuser 1987). Germination of American bittersweet is epigeal (figure 4).

A good estimate of germination can be obtained by the excised embryo method (Heit and Nelson 1941). The seeds are soaked until plump; seedcoats are removed and the embryos excised. The excised embryos are placed on moistened filter paper in covered petri dishes. A room temperature of 21 to 22 °C appears to be most satisfactory. Viable embryos will show greening of the cotyledons, will remain perfectly white in color but grow larger, or will exhibit radicle elongation. Embryos exhibiting such characteristics can be counted as being from healthy seeds, capable of germinating with proper afterripening treatment. Five to twenty days are required to secure approximate germination by the excised embryo method.

Nursery practice. In Pennsylvania, good results have been obtained by sowing cleaned seeds in the first fall after collection and extraction. The seeds are broadcast on seedbeds and firmed in with a roller; then covered with a mixture of 1 part of sand to 2 parts of sawdust. The beds are

covered with shade until germination occurs. Germination usually begins about 20 days after conditions become favorable (Musser 1970).

Another practice is to stratify cleaned or dried seeds in the pulp in January, and then sow them in the early spring. Young seedlings are somewhat susceptible to damping-off (USDA FS 1948). About 6,600 usable plants can be produced per kilogram of seeds (3,000/lb) (Van Dersal 1938). Propagation by root cuttings, layers, or stem cuttings is also sometimes practiced (Sheat 1948).

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Figure 1C*Celastrus scandens,* American bittersweet: fruiting branch, × 1.

Figure 2C*Celastrus scandens,* American bittersweet: seed with aril removed, × 8.

Figure 3C*Celastrus scandens,* American bittersweet: longitudinal section through a seed, × 10.

Figure 4C*Celastrus scandens,* American bittersweet: seedling development at 1, 2, 5, 10, and 30 days after germination.