

## *Cytisus scoparius* (L.) Link

Scotch broom

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**Growth habit, occurrence, and uses.** The genus *Cytisus* consists of about 80 species native to Eurasia and North Africa. Many are cultivated as ornamentals, and several of these have become more or less naturalized in the United States, especially in California (Munz and Keck 1959). Scotch broom *C. scoparius* (L.) Link was planted extensively for erosion control during the first half of the century (Gill and Pogge 1974) but is now considered a serious invasive weed throughout the range of its introduction in North America, Australia, and New Zealand (Bossard 1991). It has become the dominant species on several hundred thousand hectares of coastal and cismontane vegetation, from Santa Barbara, California, north to British Columbia. It is a drought-deciduous shrub with angled, photosynthetic stems that is able to root-sprout following fire (Bossard and Rejmanek 1994; Gonzales-Andres and Ortiz 1997). It is largely useless as a browse-plant because of its toxic foliage, a feature that may permit it to increase at the expense of more palatable species (Bossard and Rejmanek 1994; Gill and Pogge 1974). It increases in response to disturbance of native vegetation and is also a serious weed problem in pine plantations in California and New Zealand.

However, because of its beauty and exceptional summer drought-hardiness, Scotch broom is considered valuable as an ornamental shrub for low-maintenance landscapes. The species is very showy in flower and its evergreen stems add interest to winter landscapes. There are over 60 named varieties (Wyman 1986).

**Flowering and fruiting.** The perfect flowers are of typical pea-family form and appear on the plants in great profusion in May and June. Each flower must be Atripped@ by an appropriate pollinator for fertilization to take place, so the mutualistic relationship with honey bees and native bumblebees is essentially obligatory (Parker 1997). Other native North American insects seem to ignore its fragrant blossoms, preferring to work the flowers of indigenous species. The result is that seed production may be severely pollinator-limited (Parker 1997). In spite of this, the plants may produce a prodigious number of seeds; the estimated mean annual production per plant was about 10,000 seeds in 2 California populations (Bossard and Rejmanek 1994). Host-specific pre-dispersal seed predators from Europe (a seed weevil and a bruchid beetle) have been introduced for biocontrol of Scotch broom in the Northwest, but so far these introductions have been largely ineffective, possibly because of asynchrony in the phenology of host and seed predator (Bravo 1980).

Plants reach reproductive maturity at about 4 years of age (Gill and Pogge 1974). The 5- or 6-seeded legumes (pods) ripen in August, and seeds are dispersed in September. The legumes open abruptly with a springing motion, vaulting the seeds some distance from the plant (Bossard 1991;

Bossard and Rejmanek 1994). The seeds possess a strophiole or elaiosome at the hilar end and are secondarily dispersed by ants (Bossard 1991; Weiss 1909). At 2 California study sites, seeds were taken by mice and by ground-feeding birds, but these organisms were strictly seed predators and did not function as dispersers (Bossard 1991).

Seeds of Scotch broom have the capacity to form a persistent seed bank. Bossard (1993) found in seed retrieval experiments that 65% germinated the first year after dispersal, 20% germinated the second year, and 10% germinated the third year. About 5% of the seed population carried over for more than 3 years.

**Seed collection, cleaning, and storage.** After the fruits ripen but before dispersal, the legumes may be hand-stripped or picked up from beneath plants. They should be spread to dry, threshed, and screened to separate the seeds (Gill and Pogge 1974). Reported seed weights have averaged 125 seeds/g (57,500/lb) in 9 samples, and viability averaged 80% in 5 samples (Gill and Pogge 1974). No long-term storage data are available, but the seeds are orthodox and remain viable for many years in storage.

**Germination and seed testing.** Scotch broom seeds have water-impermeable (hard) seedcoats and require pretreatment in order to germinate. Once the seedcoats have been made permeable, the seeds germinate well over a wide range of temperatures and do not require any further pretreatment (Bossard 1993). Mechanical and acid scarification have been used to remove hard-seededness in this species, and the official seed-testing rules call for cutting or nicking the seedcoat at the cotyledon end, then soaking in water for 3 hours (ISTA 1993). Tests should be carried out on the tops of moist paper blotters for 28 days at 20/30 °C. More recently, the effect of heat on hard-seededness in Scotch broom has received attention. Tarrega and others (1992) report that dry-heating the seeds was as effective as mechanical scarification in terms of final percentage. Optimum time of heating varied with temperature from 1 minute at 130 °C to 15 minutes at 70 °C. Abdullah and others (1989) reported that repeated brief (3-second) immersion in boiling water resulted in complete elimination of hard-seededness, but low germination percentages indicated that some damage was occurring. They found that alternating the boiling water treatments with freezing treatments (immersion in liquid nitrogen for 15 seconds) resulted in the highest germination percentages as well as in complete removal of hard-seededness. This result was confirmed by Bossard (1993), who found that vigor of seedlings from hot/cold-treated seeds was much higher than that of seedlings from seeds subjected to dry heat only.

**Nursery practice.** Scotch broom is normally propagated from cuttings for ornamental planting in order to preserve varietal characters (Wyman 1986). If seed propagation is desired, seeds should be pretreated to remove hard-seededness prior to planting (Gill and Pogge 1974). The roots are delicate, and plants are more easily produced in container culture than as bareroot stock (Wyman 1986).

## References

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**Figure 1C** *Cytisus scoparius*, Scotch broom: longitudinal section through a seed (left) and exterior view (right),  $\times 10$ .