

Rosaceae—Rose family

Cotoneaster Medik.

cotoneaster

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Growth habit, occurrence, and use. The genus *Cotoneaster* includes about 50 species of shrubs and small trees native to the temperate regions of Europe, northern Africa, and Asia (excepting Japan) (Cumming 1960). Growth habits range from nearly prostrate to upright. Cold-hardy types are more or less deciduous, whereas those native to warmer regions are evergreen (Heriteau 1990). Cotoneasters are valued as ornamentals for their glossy green foliage, attractive fruits, and interesting growth habits. Fall foliage color is often a showy blend of orange and red. Cotoneasters are adapted to sunny locations with moderately deep and moderately well-drained silty to sandy soils. Several hardy species are commonly used in mass plantings, hedges, shelterbelts, wildlife plantings, windbreaks, recreational areas, and along transportation corridors on the northern Great Plains, the southern portions of adjoining Canadian provinces, and occasionally in the Intermountain region and other areas (Plummer and others 1968; Shaw and

others 2004; Slabaugh 1974). They require little maintenance and provide ground cover, soil stabilization, snow entrapment, and aesthetic values. Peking cotoneaster provides food and cover for wildlife (Johnson and Anderson 1980; Kufeld and others 1973; Leach 1956; Miller and others 1948). Six species used in conservation plantings are described in table 1 (Hoag 1965; Nonnecke 1954; Plummer and others 1977; Rheder 1940; USDA SCS 1988; Zucker 1966). Use of cotoneasters in some areas may be limited due to their susceptibility to fire blight (infection with the bacterium *Erwinia amylovora*), borers (*Chrysobothris femorata* (Olivier)), lace bugs (*Corythucha cydonia* (Fitch)), and red spiders (*Oligonychus platani* (McGregor))(Griffiths 1994; Krüssmann 1986; Wyman 1986).

Cotoneasters are apomictic and will, therefore, propagate true from seed (Wyman 1986). However, because of the apomictic habit, many variants occur within each species (Everett 1982). This variability has been exploited in cultivar

Table 1—*Cotoneaster*, cotoneaster: nomenclature and occurrence

Scientific name & synonym(s)	Common name(s)	Occurrence
<i>C. acutifolius</i> Turcz. <i>C. acutifolia</i> Turcz. <i>C. pekinensis</i> Zab.	Peking cotoneaster	North China; introduced from North Dakota to Nebraska & upper mid-West, S Canadian prairie provinces
<i>C. apiculatus</i> Rehd. & Wilson <i>C. apiculata</i> Rehd. & Wilson	cranberry cotoneaster	W China; introduced from North Dakota to Nebraska & upper mid-West
<i>C. horizontalis</i> Dcne. <i>C. davidiana</i> Hort.	rock cotoneaster , rockspray cotoneaster, quinceberry	W China; introduced from North Dakota to Nebraska & upper mid-West, S central Washington
<i>C. integerrimus</i> Medic. <i>C. vulgaris</i> Lindl.	European cotoneaster	Europe, W Asia, Siberia
<i>C. lucidus</i> Schldl. <i>C. acutifolia</i> Lindl., not Turcz. <i>C. sinensis</i> Hort.	hedge cotoneaster	Altai Mtns & Lake Baikal region of Asia
<i>C. niger</i> (Thunb.) Fries <i>C. melanocarpus</i> Lodd.	black cotoneaster , darkseed cotoneaster	Europe to NE & central Asia, introduced from North Dakota to Nebraska

Source: Krüssmann (1986), LHBH (1976), Slabaugh (1974).

development (Krüssmann 1986; LHBH 1976). A number of hybrids have also been developed as ornamentals.

Flowering and fruiting. Cotoneaster flowers are perfect, regular, and white to pink. They develop singly or several to many together in corymbs produced at the ends of leafy lateral branchlets. Flowers are small, but in some species attractive due to their abundance. Fruits are black or red berrylike pomes that ripen in late summer or early fall and often persist into winter (Wyman 1949) (figure 1). The fruits contain 1 to 5 seeds (Rehder 1940) (figures 2 and 3), averaging 3 for Peking, hedge, and black cotoneasters; 2 for cranberry and rock cotoneasters; and 2 or 3 for European cotoneasters (Uhlinger 1968, 1970). Phenological data are provided in table 2.

Collection of fruits. Ripe fruits are collected by hand stripping or flailing in early autumn, preferably after leaf fall. Fruit firmness and color (table 3) are good criteria of ripeness. Leslie (1954) recommends that fruits of Peking, hedge, and black cotoneasters be collected slightly green. The minimum fruit-bearing age of hedge cotoneaster is 3 years. Fruit crops are produced annually.

Extraction, cleaning, and storage of seeds. Seeds may be extracted by macerating fresh fruits and skimming off or screening out the pulp. Seeds are best cleaned while fresh, because it is difficult to remove dry fleshy material by maceration. Most empty seeds can be eliminated by floating the seedlot twice in water (Uhlinger 1968, 1970). Seeds may be removed from dried fruits by abrasion (Slabaugh 1974) and the debris separated using a 2-screen fanning machine. Number of seeds per weight for 3 species are provided in table 4. About 0.5 kg (1 lb) of cleaned seeds of European cotoneaster are obtained from 2.7 kg (6 lb) of fruits (USDA SCS 1988). Seeds of the cotoneasters are orthodox in storage behavior. Leslie (1954) and USDA SCS (1988) recommend that seeds of cotoneasters be stored dry in sealed containers in a cool place. Seeds of European cotoneaster, however, can be stored in an unheated warehouse for at least 16 years without loss of viability (Jorgensen 1996; Plummer 1968).

Pregermination treatments. Seeds of many cotoneasters exhibit double dormancy due to their hard, impermeable seedcoats and the physiological condition of their embryos. First-year germination is enhanced by acid scarification followed by warm incubation and wet prechilling (USDA SCS 1988) (table 5). Addition of a commercial compost activator to the wet prechilling medium reportedly improved emergence of spreading cotoneaster—*C. divaricatus* Rehd. & Wilson (Cullum and Gordon 1994).

Figure 1—*Cotoneaster*, cotoneaster: fruits.

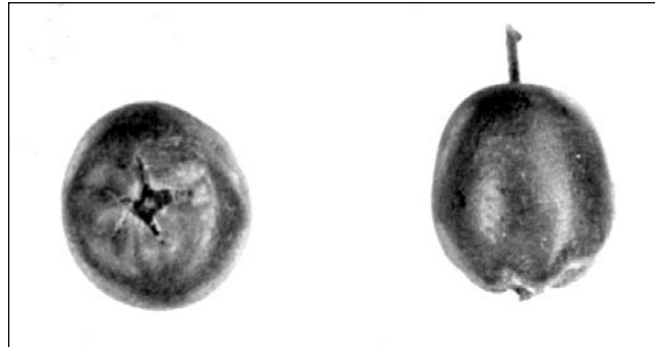


Figure 2—*Cotoneaster*, cotoneaster: seeds (from top to bottom) of *C. apiculanyus*, cranberry cotoneaster; *C. horizontalis*, rock cotoneaster; *C. lucidus*, hedge cotoneaster; *C. niger*, blackcotoneaster.

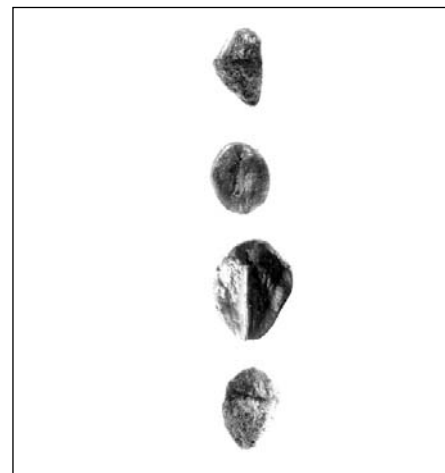


Figure 3—*Cotoneaster horizontalis*, rock cotoneaster: longitudinal section through a seed.

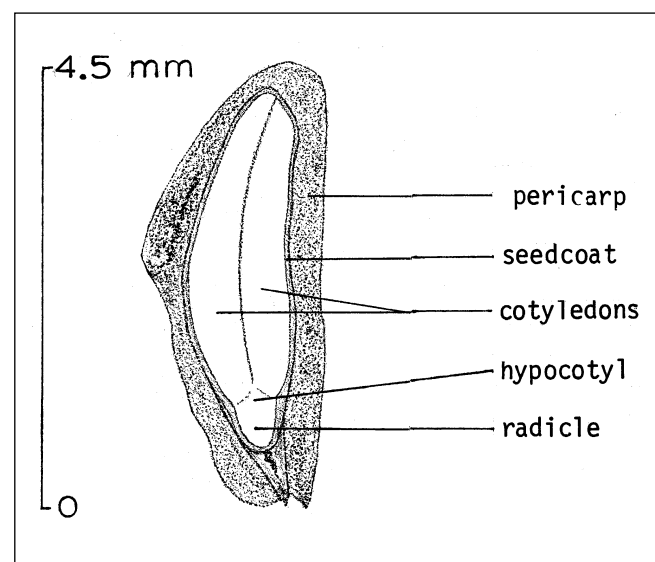


Table 2—*Cotoneaster*, cotoneaster: phenology of flowering and fruiting

Species	Location	Flowering	Fruit ripening	Seed dispersal
<i>C. acutifolius</i>	N Great Plains	May–June	Sept–Oct	Sept–winter
<i>C. apiculatus</i>	S Michigan	May–June	Aug–Sept	Fall–winter
<i>C. horizontalis</i>	—	June	Sept–Nov	Sept–winter
<i>C. integerrimus</i>	Great Plains	May–June	Aug–Sept	—
<i>C. lucidus</i>	North Dakota	May–June	Sept	—
<i>C. niger</i>	—	May–June	—	—

Sources: Krüssmann (1986), Macdonald (1986), Slabaugh (1974), USDA SCS (1988), Zucker (1966).

Table 3—*Cotoneaster*, cotoneaster: height, year first cultivated, and color of flowers and ripe fruit

Species	Height at maturity (m)	Year first cultivated	Flower color	Color of ripe fruit
<i>C. acutifolius</i>	1.8–3.9	1883	Pink	Black
<i>C. apiculatus</i>	0.3–1.5	1910	Pink	Scarlet
<i>C. horizontalis</i>	0.9–1.2	1880	White-pink	Light to dark red
<i>C. integerrimus</i>	1.2–3.6	—	Pinkish	Red
<i>C. lucidus</i>	1.8–2.7	1840	White, tinged w/pink	Black
<i>C. niger</i>	1.5–2.4	1829	Pinkish-white	Blackish red

Sources: Griffiths (1994), Hoag (1958, 1965), LHBH (1976), Leslie (1954), Krüssmann (1986), Rehder (1940), Rosendahl (1955), USDA SCS (1988).

Table 4—*Cotoneaster*, cotoneaster: seed yield data

Species	Cleaned seeds/weight			
	Range		Average	
	/kg	/lb	/kg	/lb
<i>C. acutifolius</i>	48,466–58,212	21,984–26,405	59,300	26,900
<i>C. horizontalis</i>	—	—	141,094	64,000
<i>C. integerrimus</i>	—	—	35,274	16,000
<i>C. lucidus</i>	—	—	51,560	23,390

Sources: Cumming (1960), McDermand (1969), Plummer and others (1968), Slabaugh (1974), Uhlinger (1968, 1970), USDA SCS (1988).

Table 5—*Cotoneaster*, cotoneaster: pregermination treatments

Species	Immersion time in conc H ₂ SO ₄ (min)	Wet prechill at 4 °C	
		Medium	Period (days)
<i>C. acutifolius</i>	10–90	Peat	30–90
<i>C. apiculatus</i>	60–120	Sand & peat	60–90
<i>C. horizontalis</i>	90–180	Peat	90–120
<i>C. integerrimus</i>	120	—	120*
<i>C. lucidus</i>	5–20	Sand & perlite	30–90
<i>C. niger</i>	10–90	Peat	30–90

Sources: Dirr and Heuser (1987), Fordham (1962), Leslie (1954), McDermand (1969), Slabaugh (1974), Smith (1951), Uhlinger (1968, 1970), USDA SCS (1988).

* Wet prechilling was preceded by 90 days of warm incubation at 21 °C.

Duration of effective pretreatments varies with species, seedlot, and year due to differences in seedcoat thickness and degree of embryo dormancy. Meyer (1988), for example, found that seeds of cranberry and spreading cotoneasters scarified for 1.5 hours in concentrated sulfuric acid germinated over an increasing range of incubation temperatures as the duration of wet prechilling at 2 °C increased from 0 to 4 months. After 4 months of prechilling, germination of both species occurred at constant incubation temperatures from 4.5 to 26.5 °C. This variability in response adds to the difficulty of securing prompt, consistent germination (Uhlinger 1968, 1970).

Germination tests. Table 6 lists germination test conditions and results for 4 cotoneaster species (see table 5 for pretreatments). The effect of light on germination of seeds of Peking, hedge, and black cotoneasters varies among seedlots, but germination of black cotoneaster was generally improved by exposure to cool-white fluorescent light (Uhlinger 1968, 1970). Pretreatment with gibberellic acid partially replaced the effect of light (Uhlinger 1968, 1970).

Because of the dormancy in these seeds, the International Seed Testing Association recommends use of tetrazolium staining rather than germination tests for evaluation of seed quality (ISTA 1993). Seeds are stained by first soaking them in water for 18 hours, then removing the distal third of the seeds with a transverse cut; and finally placing the seeds in a 1.0% solution of tetrazolium chloride for 20 to 24 hours. Viable seeds usually stain completely, but seeds are considered viable if only the radicle tip and the distal third of the cotyledons are unstained (ISTA 1993).

The excised embryo method may also be used to test seed germinability of spreading cotoneaster (Smith 1951). Seeds are first scarified in sulfuric acid for 3 hours, then soaked in 27 °C tapwater for 2 days before the embryos are excised and incubated under conditions favorable for germination.

Nursery practice. Seeds of cotoneaster species may be given appropriate scarification pretreatments and seeded in midsummer to provide the warm incubation and overwinter wet-prechilling required to relieve dormancy and permit germination in the spring. Scarified seeds provided with warm incubation pretreatment in the laboratory may be fall-planted; however, scarification, warm incubation, and wet prechilling in the laboratory are required for spring-planting. A seeding rate of 250 seeds/m² (23/ft²) is recommended for producing lining-out stock of rock cotoneaster (Macdonald 1993); 100 to 130 seeds/m² (10 to 12/ft²) are recommended for European cotoneaster var. ‘Centennial’ (USDA SCS 1988). Seeds of this variety are planted 0.3 cm (0.1 in) deep and covered with 1.5 to 2 cm (3/5 to 4/5 in) of soil (USDA SCS 1988). European and hedge cotoneaster seedbeds may be mulched with hay or other suitable material (Hinds 1969; USDA SCS 1988). Filtered shade until August is recommended for seedlings of Peking, hedge, and black cotoneasters (Leslie 1954). For hedge cotoneaster, an average seedling yield of 30% was obtained in a North Dakota nursery (Hinds 1969). Seedlings of this species are usually ready for outplanting after 2 growing seasons.

Cotoneasters are propagated vegetatively from softwood and occasionally from hardwood cuttings (Dirr and Heuser 1987; Wyman 1986). Cuttings are taken from June to August (Dirr and Heuser 1987) and treated with 1,000 to 3,000 ppm IBA. Macdonald (1993) recommended that heel cuttings be used when evergreen species are rooted in cold frames. Cuttings, particularly those of evergreen species, root readily and are easily transplanted and overwintered. Layering and grafting are also used to obtain small numbers of plants.

Field planting. Nursery stock is generally used to establish conservation plantings. Wildland seedings of Peking cotoneaster have been only marginally successful

Table 6—Cotoneaster, cotoneaster: germination test conditions and results

Species	Germination test conditions				Percentage germination		
	Daily light (hrs)	Medium	Temp (°C)		Days	Avg (%)	Samples #
			Day	Night			
<i>C. acutifolius</i>	9	Wet paper	25	10	—	70–80	—
<i>C. horizontalis</i>	24	Wet paper	27	—	—	100	—
	24	Sand	30	20	100	30	5+
<i>C. lucidus</i>	9	Wet paper	25	10	—	70	—
<i>C. niger</i>	9	Wet paper	25	10	—	80	—

Sources: Smith (1951), Slabaugh (1954), Uhlinger (1968 & 1970).

(Shaw and others 2004). Germination is erratic and seedlings grow slowly, particularly if the site is not kept weed-free.

Bareroot plantings of European cotoneaster Centennial may be established using 1+0 or 2+0 bareroot seedlings with stem diameters of 0.5 to 1.3 cm ($1/5$ to $1/3$ in) just

above the root collar (USDA SCS 1988). Seedlings should be planted in fallowed ground at 1.2- to 1.5-m (4- to 5-ft) spacings immediately after the soil thaws in spring. At least 5 years of weed control are often required. Average survival ranges from 70 to 95% (USDA SCS 1988). Fruit-producing stands are obtained in 3 to 4 years.

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