ZygophyllaceaeCCaltrop family

Larrea tridentata (Sessé & Moc. ex DC.) Coville

creosotebush

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Synonyms. *Larrea tridentata* (DC.) Cov.

Other common names. greasewood, gobernadora, hediondilla.

Growth habit and occurrence. Creosotebush C*Larrea tridentata* (Sessé & Moc. ex DC.) CovilleCis an evergreen shrub native to the arid subtropical regions of the southwestern United States, Mexico, Argentina, and Chile (Benson and Darrow 1945). Whether the North American species *L. tridentata* is distinct from the South American species *L. divaricata* Cav. has been unclear (Benson and Darrow 1945), but most recent authors recognize *L. tridentata* as a separate species. It is the dominant shrub in all 3 warm deserts of the United States: the Mojave, Sonoran, and Chihuahuan Deserts (Barbour and others 1980). Although creosotebush can grow on a variety of substrates, it is most abundant on calcareous soils (Musick 1978). Stands vary in density and stature, depending on the aridity of the site (Woodell and others 1969). Under very low rainfall, shrubs are smaller and more widely spaced than those in stands under more mesic conditions. Morphological and physiological adaptations of the genus *Larrea* to growth under xeric conditions are well studied (Barbour and others 1974, 1977). Despite dominance of the species in xeric sites, the emergence and growth of seedlings is favored by mesic conditions. Moisture, neutral pH, low salinity, and moderate temperatures are conducive to successful germination and seedling establishment (Barbour and others 1977).

Use. Creosotebush is not browsed by livestock. Although an edible livestock feed has been made from creosotebush and a valuable antitoxidant has been extracted from the shrub (Duisberg 1952), no economically feasible program for gathering and using large amounts of creosotebush has been developed. Creosotebush, like other common plants with peculiar odor or taste, has been used in primitive medicine to cure various ills (Benson and Darrow 1945). In arid and semiarid parts of the Southwest, creosotebush is used for landscaping and reclamation of disturbed lands (Day and Ludeke 1980; Graves and others 1978; Williams and others 1974).

Flowering and fruiting. Creosotebush has perfect flowers. It blooms most profusely in the spring but may flower from time to time throughout the year (Kearney and Peebles 1951; Valentine and Gerard 1968). The fruit is a densely white, villous, 5-celled capsule (Kearney and Peebles 1951). When fruits are cast, they separate into individual carpels, each normally containing 1 seed (figures 1 and 2) (Martin 1969). Carpel fill under natural conditions averages 35% (range 12 to 62%) (Valentine and Gerard 1968). Plants may fruit sparingly at 4 to 6 years of age and reach full fruiting maturity at 8 to 13 years (Martin 1974). Annual production ranges from 39 to 278 fruits/100 g (11 to 79/oz) of branch or from 119 to 1,714 fruits/plant (Valentine and Gerard 1968).

Collection, extraction, and storage. Ripe fruits may be collected from the shrub in the late spring or early summer. Fumigation or dusting fruits with insecticide is advisable to prevent insect damage. Clean seeds, extracted from the carpels, are small—there are about 374,800/kg (170,000/lb)—and are not usually available on the market (Knipe and Herbel 1966; Martin 1969). Viability of seeds in carpels declined little after 2 to 4 years in dry storage at room temperatures, and some 7- to 8-year-old lots germinated well (Barbour and others 1977; Valentine and Gerard 1968). This information strongly suggests that the seeds are orthodox in storage behavior and should store well for many years at low temperatures and moisture contents.

Pregermination treatments. Creosotebush seeds in carpels exhibit some seedcoat dormancy (McGee and Marshall 1993). Germination can be increased by removal of the carpel (Tipton 1984) and, to a lesser extent, by leaching of the intact carpel (Barbour 1968; Tipton 1984). Partial destruction of the carpel by mechanical abrasion is known to increase germination. Seeds in carpels so treated have a high average percentage germination (93%) over a range of 10 to 60 ° C. Yet, exposing seeds to warm temperatures (over 37 ° C) has been found to reduce germination, and continuous exposure to cold temperatures prior to sowing is desirable (Barbour 1968). Storage in partially sealed plastic bags with activated carbon for 30 days at 2 ° C is recommended for high percentage germination (Graves and others 1975).

Germination. There are no official testing prescriptions for creosotebush. In one series of tests, germination of unscarified seeds (computed on filled carpel basis) in carpels at 17 ° C ranged from 55 to 90% (average 74%) (Valentine and Gerard 1968). Carpels were dusted with fungicide and placed on moist blotter paper in petri dishes in humidified germinators (Valentine and Gerard 1968). Fungicide treatments may delay and reduce germination, however (Tipton 1985). Conditions conducive to germination include darkness (Barbour 1968; Tipton 1985), high moisture with wetting and drying cycles (Barbour 1968; McGee and Marshall 1993), temperatures near 23 ° C, low salinity, and near-zero osmotic pressure (Barbour 1968).

Seedling care. Seedling survival is very low in natural populations (Ackerman 1979), and large-scale seedling establishment is thought to be rare (Barbour 1968). Heavy rains in late summer increase seedling germination and survival (Ackerman 1979; Boyd and Brum 1983). Under laboratory conditions, maximum root growth occurred at 29 ° C in a medium that was slightly acidic, non-saline, and near-zero in osmotic pressure (Barbour 1968). Seedlings grown in acidic media are highly susceptible to phosphorus toxicity (Musick 1978).

Literature Cited

Ackerman TL. 1979. Germination and survival of perennial plant species in the Mojave Desert. Southwestern Naturalist 24: 399–408.

Barbour MG. 1968. Germination requirements of the desert shrub *Larrea divaricata*. Ecology 49: 915–923.

Barbour MG, Burk JH, Pitts, WD. 1980. Terrestrial plant ecology. Menlo Park, CA: Benjamin/Cummings Publishing. 604 p.

Barbour MG, Cunningham GL, Oechel WC, Bamberg SA. 1977. Growth and development, form and function. In: Mabry TJ, Hunziker JH, Difeo DR, eds. Creosote bush. Stroudsburg,

PA: Dowden, Hutchinson, and Ross: 48B91.
Barbour MG, Diaz DV, Breidenbach RW. 1974. Contributions to the biology of *Larrea* species. Ecology 55: 1199B1215.
Benson L, Darrow RA. 1945. A manual of southwestern trees and shrubs. Biol. Sci. Bull. 6. [Tucson]: University of Arizona. 411 p.
Boyd RS, Brum GD. 1983. Postdispersal reproductive biology of a Mojave Desert population of *Larrea tridentata* (Zygophyllaceae). American Midland Naturalist 110: 25B36.
Day AD, Ludeke KL. 1980. Reclamation of copper mine wastes with shrubs in the southwestern U. S. A. Journal of Arid Environments 3: 107B112.
Duisberg PC. 1952. Development of a feed from creosotebush (*Larrea divaricata*) determination of its nutritive value. Journal of Animal Science 11: 174B180.
Graves WL, Kay BL, Williams WA. 1975. Seed treatment of Mojave Desert shrubs. Agronomy Journal 67: 773B777.
Graves WL, Kay BL, Williams WA. 1978. Revegetation of disturbed sites in the Mojave Desert with native shrubs. California Agriculture 32: 4B5.
Kearney TH, Peebles RH. 1951. Arizona flora. Berkeley: University of California Press. 1032 p.
Knipe D, Herbel CH. 1966. Germination and growth of some semidesert grassland species treated with aqueous extract from creosotebush. Ecology 47: 775B781.
Martin SC. 1974. *Larrea tridentata,* creosotebush. In: Schopmeyer CS, tech. coord. Seeds of woody plants in the United States. Agric. Handbk. 450. Washington, DC: USDA Forest Service: 486B487.
McGee KP, Marshall DL. 1993. Effects of variable moisture availability on seed germination in three populations of *Larrea tridentata*. American Midland Naturalist 130: 75B82.
Musick HB. 1978. Phosphorus toxicity in seedlings of *Larrea divaricata* grown in solution culture. Botanical Gazette 139: 108B111.
Tipton JL. 1984. Evaluation of three growth curve models for germination data analysis. Journal of the American Society of Horticultural Science 109: 451B454.
Tipton JL. 1985. Light, osmotic stress, and fungicides affect hulled creosotebush mericarp germination. Journal of the American Society of Horticultural Science 110: 615B618.
Valentine KA, Gerard JB. 1968. Life history and characteristics of the creosotebush, *Larrea tridentata*. Bull. 526. Las Cruces: New Mexico State University Agricultural Experiment Station. 32 p.
Williams WA, Cook OD, Kay BL. 1974. Germination of native desert shrubs. California Agriculture 28: 13.
Woodell SRJ, Mooney HA, Hill AJ. 1969. The behaviour of *Larrea divaricata* (creosote bush) in response to rainfall in California. Journal of Ecology 57: 37B44.

Figure 1C*Larrea tridentata,* creosotebush: single carpel, × 8.

Figure 2C*Larrea tridentata,* creosotebush: longitudinal section through a carpel, × 12.