Asteraceae—Aster family

Encelia Adans.

encelia

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Other common names. brittlebush, bush-sunflower.

Growth habit, occurrence and uses. The brittlebush genus—*Encelia*—includes 14 species of low branching shrubs native to western America. The plants are suffrutescent, often with a pungent odor (Benson and Darrow 1954). Ray flowers (sometimes absent) are yellow, usually conspicuous when present, and produce neither pollen or fertile seeds. Disk flowers are yellow or purple (Benson and Darrow 1954). Species frequently hybridize, especially in disturbed areas. Species commonly found in the southwestern United States are listed in table 1.

The brittle wood secretes a clear resin used by Native Americans as a glue. In some parts of Mexico, the resin has been burned as incense for religious ceremonies (Benson and Darrow 1954). The Cahuilla of the southwest United States have used gum from this plant as a medicine; the gum was heated and applied to the chest to relieve pain (Bean and Saubel 1972).

Flowering and fruiting. Flowering can begin in February and continue through July, weather conditions permitting. Most encelia flowerheads are yellow or a brown- or yellow-purple. The achenes are densely compressed, obovate or wedge-shaped, with edges that are long-ciliate and faces that are glabrous or short-hairy (Jepson 1993).

Collection, extraction, and storage. Timing of seed collection is critical, as the achenes are easily blown from the plant after maturity (Kay and others 1977). Seeds may be hand-harvested and stored successfully for several years. Cleaning is difficult, for seeds are often mixed with dry flower and plant parts of similar size and weight. Studies on long-term storage of seeds of rayless encelia and Acton brittlebush showed good germination after 4 and 14 years, respectively (Kay and others 1988). Seeds of both species that were stored under 4 conditions (!15 EC, 4 EC, room temperature, and warehouse temperatures) also showed significantly poorer germination rates in the warehouse after 3 years. Storage conditions studied by Padgett and others (1999) showed that seedlots stored for 6 months in a standard refrigerator held at about 5 to 10 EC exhibited 2 to 3 times greater germination percentages than those stored at room temperature.

Pregermination treatment and germination tests. No seed treatment is necessary (Emery 1988). Some research has been done to test dormancy in encelias, especially in brittlebush. At Joshua Tree National Park (JTNP), germination of brittlebush was tested with direct sowing and with the following seed treatments: a 24-hour cold water soaking, a 6-hour cold water soaking, and a 24-hour leaching, with all seeds sown on moist blotter paper (CALR 1993). Results showed very low germination rates (<1%). Research at the University of California at Riverside (UCR) has shown that the most significant cause of poor germination is

lack of viable embryos in nearly half of the seeds tested for viability and germination behavior (Padgett and others 1999). Pre-soaking appears critical, and gibberellic acid (GA) has enhanced germination rates 2 to 3-fold (Padgett and others 1999). Treatment tests subjected seeds to warm water soaking for 30 minutes, followed by soaking in 100 ppm GA in water for 30 minutes. These treated seeds were then sown on or in 3 different media: UCR soil mix, vermiculite, and germination paper. All seeds were incubated in low light at 25 to 30 EC. Two general trends were observed: seed treatment with gibberellic acid for 30 minutes significantly increases germination rates, and sowing into vermiculite followed by transplantation into sterile potting medium appears to be the best method for seedling germination and survival. The vermiculite is pre-soaked, and misted every 2 days to avoid drying out. Seeds sown into the UCR soil mix had severe damping-off problems, and results from the germination paper are thus far inconclusive. From the vermiculite, seedlings were successfully transplanted to larger containers and maintained in greenhouse conditions.

Work with Acton brittlebrush has correlated temperature and germination rates (Kay and others 1997):

Temperature (EC)	2	5	10	15	20	25	30	40
Germination (%)	0	1	47	65	55	5	7	0

Seeds were collected in late June 1973, yielding 1.96 kg of material of 24% purity. Cleaned seeds were 86% pure and had a pure fruit weight of 477,000 achenes/kg (216,721/lb). Emergence testing of encelia seedlots planted at 1-cm (2/5 in) depth over a 10-day period showed a total emergence of 57%. Emergence at a 2-cm (4/5 in) depth was somewhat reduced and delayed, whereas no plants emerged from a 4-cm depth (Kay 1975).

Nursery practice. Both cuttings and seedlings of brittlebush and Virgin River encelia have been successfully planted into 76-cm (30-in) tall and 15.2-cm (6-in) diameter tubes at JTNP using a mixture of sand, perlite, and mulch with a slow-release fertilizer. Both species were also grown in 3.8-liter (1-gal) pots, 15.1-liter (4-gal) pots, and plant bands, with the greatest outplanting success being the 76-cm (30-in) tubes or "tall pots" (CALR 1993). Plants in the nursery require a hardening-off period of 1 to 2 weeks and may be subject to aphid predation. Seedlings must be transplanted with care, for branches break off easily (CALR 1993).

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Table 1— *Encelia,* encelia: nomenclature and occurrence

Scientific name	Common names	Occurrence
***E. californica* Nutt.**	**California brittlebush**	Coastal California scrub to Baja California
***E. farinosa* Gray ex Torr.**	**brittlebush,** incienso, goldenhills	Deserts of SW Utah, Arizona, & NW Mexico
***E. frutescens* (Gray) Gray**	**rayless encelia**, green brittlebush	Deserts of S Nevada, W Arizona, & Baja California
***E. virginensis* A. Nels.**	**Virgin River encelia,** brittlebush	E Mojave to SW Virgin River, Utah, & NW Arizona
***E. virginensis* var. *actonii* (Elmer) B.L. Turner**	**Acton brittlebush**	SW California, SW Nevada to N Baja California

Source: Jepson (1993).