

Ziziphus P. Mill.

jujube

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Growth habit and occurrence. There are about 100 species of this genus, which is composed of trees, shrubs, and lianas found chiefly in the tropical and subtropical regions of the world (Johnston 1963). There are 7 species native to the United States and Mexico, but none of them are of economic importance (Lyrene 1979). However, 2 exotic species, which are small deciduous trees, have been planted in this country for fruit production, wildlife food, and watershed protection (table 1). Common jujube (*Ziziphus jujuba* Mill.), the most commonly planted species, may grow to heights of 15 m at maturity (Vines 1960). This species has been cultivated for about 4,000 years in China and grown in this country for over 150 years (Bonner and Rudolf 1974; Lyrene 1979; Mowry and others 1953). Both common jujube and Christ-thorn (*Z. spina-christi* Willd.) are highly valued for fruit production and numerous agroforestry uses in Africa and Asia (Von Carlowitz 1986), where there are many selected cultivars.

Flowering and fruiting. The perfect, yellow flowers of common jujube appear in March to May in the United States, and the reddish-brown fruits mature from July to November. The fruits are globose to slender, fleshy drupes, which turn from green to dark reddish brown at maturity. If left on the tree, the fruits will turn black (Bailey 1939; Vines 1960). Common jujube drupes are oblong and 2.5 to 5 cm in length. They contain a 2-celled and 2-seeded pointed stone that is deeply furrowed, reddish brown to deep gray, oblong, and 2 to 2.5 cm long (figure 1) (Bonner and Rudolf 1974; Mowry and others 1953). Trees bear fruit as early as 1 to 4 years after planting (Lyrene 1979). Good crops are borne annually, and although they are popular for human consumption in Asia and Europe, the fruits from trees grown in the United States have apparently not been as edible. The crisp flesh of common jujube is whitish in color and has a sweet to subacid taste (Mowry and others 1953; Goor 1955; Vines 1960).

Collection, extraction, and storage. Jujube drupes may be picked by hand or flailed onto canvas sheets in the fall. Stones can be depulped by running them through a macerator with water and floating off the pulp. The cleaned stones are used as seeds. Seed yields are as follows (Goor 1955; Bonner and Rudolf 1974):

	Common jujube	Christ-thorn
Cleaned seeds per weight of drupesC		
kg/45 kg (lb/100 lb)	12B16 (25B35)	C
Cleaned seeds per weightCkg (lb)	1,650 (750)	1,500 (680)

No conclusive storage data are available for this genus, but dry storage at room temperature has been successful for Christ-thorn (Goor 1955). Because these seeds appear to be orthodox, storage at low moisture contents at 5 °C is suggested.

Pregermination treatments. Jujube seeds are moderately dormant and require treatment for prompt germination. Stratification recommendations for common jujube are 60 to 90 days in moist sand at 5 °C (Bonner and Rudolf 1974) or 3 months warm incubation, followed by 3 months cold stratification (Dirr and Heuser 1987). Some growers recommend scarification in sulfuric acid for 2 to 6 hours, followed by stratification at 5 °C for 60 to 90 days (Lyrene 1979). Very prompt germination was obtained for seeds of Christ-thorn in Israel by soaking them for 2 days in water at 21 to 38 °C. Shorter or longer periods were not as successful (Gindel 1947).

Germination tests. Germination tests with seeds treated as described above are summarized in table 2.

Nursery practice. Untreated stones of common jujube can be sown in drills in the fall; stones stratified for 90 days may be sown in the spring. They should be covered with 2.5 cm (1 in) of soil (Bonner and Rudolf 1974). In Israel, 2 days of water-soaking prior to sowing has been recommended for Christ-thorn (Gindel 1947). Intact drupes may also be sown in the nursery (Goor 1955). Germination is epigeal. Vegetative propagation is possible by root cuttings (Dirr and Heuser 1987).

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Figure 1C *Ziziphus jujuba*, common jujube: longitudinal section through 2 seeds in a stone (**left**), exterior view of a seed after removal from a stone (**center**), exterior view of a seed (**right**), $\times 2$.

Table 1C *Ziziphus*, jujube: nomenclature and occurrence

Scientific name	Common name	Occurrence
<i>Z. jujuba</i> Mill.	common jujube , jujube, Chinese date	Native to Asia, Africa, & SE Europe; planted in S US from Florida to California; naturalized on Gulf Coast from Alabama to Louisiana
<i>Z. spina-christi</i> Willd.	Christ-thorn	Native to arid & semi-arid regions of Africa & W Asia; planted in SW US

Sources: Bonner and Rudolf (1974), Vines (1960).

Table 2C*Ziziphus*, jujube: germination test conditions and results

Species	Medium	Germ. test conditions			Germ. rate		Germ. percentage	
		Temp (°C)			Amt (%)	Days	Ave. (%)	Samples
		Day	Night	Days				
<i>Z. jujuba</i>	Sand	30	21	50	C	C	31	2
<i>Z. spina-christi</i>	C	38	38	4	65	2	85	4

Source: Bonner and Rudolf (1974).

Germ. = germination.