Taxon: Ziziphus jujuba Mill. **Family:** Rhamnaceae

Common Name(s): Chinese date
Chinese jujube
common jujube
jujube

Synonym(s): Paliurus mairei H. Lév.
Rhamnus jujuba L.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 4 Jun 2020

WRA Score: 5.0 **Designation:** **Rating:**

Keywords: Spiny Shrub, Naturalized Elsewhere, Edible Fruit, Self-Incompatible, Bird-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	y
102	Has the species become naturalized where grown?	y=1, n=-1	y
103	Does the species have weedy races?	y=1, n=-1	y
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	Intermediate
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	y
303	Agricultural/forestry/horticultural weed		
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	y
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems		

Qsn #	Question	Answer Option	Answer
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	y
604	Self-compatible or apomictic	y=1, n=-1	n
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m2)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**y**
	Source(s)	**Notes**
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	"Chinese jujube originated in China where they have been cultivated for more than 4,000 years. It was distributed beyond China centuries ago and today it is cultivated to some extent in Russia, northern Africa, southern Europe, the Middle East, Caribbean and the southwestern United States. It is widely cultivated and naturalized in Eurasia."

102	**Has the species become naturalized where grown?**	**y**
	Source(s)	**Notes**
	Nelson, G., Earle, C.J. & Spellenberg, R. (2014). Trees of Eastern North America. Princeton University Press, Princeton, NJ	"Introduced from Europe and Asia; irregularly established from cultivation in the East, including locations in Ala., Fla., Ga., La., and Tex."
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	"It is widely cultivated and naturalized in Eurasia."
	Godfrey, R. K. (1988). Trees, Shrubs, and Woody Vines of Northern Florida and Adjacent Georgia and Alabama. University of Georgia Press, Athens, GA	"Native to warmer and drier parts of the Old World. In our area, infrequently planted, sparingly naturalized, sometimes at a considerable distance from the parent tree."

103	**Does the species have weedy races?**	**y**
	Source(s)	**Notes**
	Gilman, E.F. & Watson, D.G. (2006). Ziziphus jujuba: Chinese Date. ENH-836. Revised. University of Florida, IFAS, Gainesville, FL. http://edis.ifas.ufl.edu.. [Accessed]	"No pests or diseases are of major concern."
	Outlaw, W. H., et al. (2002). The jujube (Ziziphus jujuba Mill.), a multipurpose plant. Economic Botany, 56(2), 198-200	"On the other hand, jujube culture is not entirely carefree. First, the tree is potentially weedy because it forms root sprouts."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Cereals"

201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**Intermediate**
	Source(s)	**Notes**
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	"Chinese jujube although a mild temperate species can withstand extremely hot, dry temperatures, as well as cold temperatures down to −22°C. Winter dormancy allows it to withstand temperatures to subzero temperatures, yet it requires only a small amount of winter chill in order for it to set fruit."

Qsn #	Question	Answer
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 2 Jun 2020]	"Native "Asia-Temperate: CHINA: China [Anhui Sheng, Zhejiang Sheng, Fujian Sheng, Henan Sheng, Hebei Sheng, Hunan Sheng, Hubei Sheng, Gansu Sheng, Jiangxi Sheng, Jiangsu Sheng, Guangdong Sheng, Guizhou Sheng, Liaoning Sheng, Shanxi Sheng, Shandong Sheng, Shaanxi Sheng, Sichuan Sheng, Yunnan Sheng, Nei Mongol Zizhiqu, Guangxi Zhuangzu Zizhiqu, Ningxia Huizi Zizhiqu, Xinjiang Uygur Zizhiqu]"
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Preferred Climate/s: Dryland, Mediterranean, Subtropical, Tropical"

202	Quality of climate match data	High
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 2 Jun 2020]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	**Notes**
	Outlaw, W. H., et al. (2002). The jujube (Ziziphus jujuba Mill.), a multipurpose plant. Economic Botany, 56(2), 198-200	"Although it is better adapted to arid regions, it will tolerate a range of climatic conditions (see 11), including the humid Gulf Coast region (8; Travis Callahan pers. comm.) '
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Altitude range: 500 - 1800 m - Mean annual rainfall: 125 - 0 mm - Rainfall regime: summer; winter; bimodal - Dry season duration: 4 - 8 months - Mean annual temperature: 15 - 24ºC - Mean maximum temperature of hottest month: 23 - 36ºC - Mean minimum temperature of coldest month: 4 - 11ºC - Absolute minimum temperature: > 3ºC"
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	"Chinese jujube although a mild temperate species can withstand extremely hot, dry temperatures, as well as cold temperatures down to −22°C. Winter dormancy allows it to withstand temperatures to subzero temperatures, yet it requires only a small amount of winter chill in order for it to set fruit. In its native range it is found in mountains, hills, sunny dry slopes, plains and is also widely cultivated below 1,700 m. Chinese jujube is fairly adaptable, but should be grown in full sun as they are shade intolerant."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Preferred Climate/s: Dryland, Mediterranean, Subtropical, Tropical"

Qsn #	Question	Answer
	Godfrey, R. K. (1988). Trees, Shrubs, and Woody Vines of Northern Florida and Adjacent Georgia and Alabama. University of Georgia Press, Athens, GA	[Naturalized in subtropical regions] "Native to warmer and drier parts of the Old World. In our area, infrequently planted, sparingly naturalized, sometimes at a considerable distance from the parent tree."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	"Chinese jujube originated in China where they have been cultivated for more than 4,000 years. It was distributed beyond China centuries ago and today it is cultivated to some extent in Russia, northern Africa, southern Europe, the Middle East, Caribbean and the southwestern United States. It is widely cultivated and naturalized in Eurasia."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 2 Jun 2020]	"Cultivated Africa Africa Asia-Temperate WESTERN ASIA: Afghanistan, Iran, Iraq CHINA: China EASTERN ASIA: Japan Asia-Tropical INDIAN SUBCONTINENT: India, Pakistan Europe Europe Northern America North America Southern America South America"
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2007. Flora of China. Vol. 12 (Hippocastanaceae through Theaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Mountains, hills, sunny dry slopes, plains, also widely cultivated; below 1700 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Yunnan, Zhejiang [cultivated in Africa, Asia, Europe, and North and South America]."

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"It is found in many countries in Asia, including India and Pakistan, and in Europe and America, either wild or naturalized, up to altitudes of 1800 m."
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	"It is widely cultivated and naturalized in Eurasia."
	Godfrey, R. K. (1988). Trees, Shrubs, and Woody Vines of Northern Florida and Adjacent Georgia and Alabama. University of Georgia Press, Athens, GA	"Native to warmer and drier parts of the Old World. In our area, infrequently planted, sparingly naturalized, sometimes at a considerable distance from the parent tree."

302	Garden/amenity/disturbance weed	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Gilman, E.F. & Watson, D.G. (2006). Ziziphus jujuba: Chinese Date. ENH-836. Revised. University of Florida, IFAS, Gainesville, FL. http://edis.ifas.ufl.edu.. [Accessed 3 Jun 2020]	"Invasive potential: invasive non-native"
	Outlaw, W. H., et al. (2002). The jujube (Ziziphus jujuba Mill.), a multipurpose plant. Economic Botany, 56(2), 198-200	"On the other hand, jujube culture is not entirely carefree. First, the tree is potentially weedy because it forms root sprouts."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[Cited as a weed in a number of countries. Potential agricultural weed] "Weed of: Cereals References: Australia-CN-468, Global-N- 85, Japan-N-287, Pacific-W-621, Japan-N- 794, Spain-W-807, France-N-1006, France- N-1006, Malta-N-1006, Turkey-N-1006, United States of America-I-979, United States of America-NW-939, Europe-N-819, Madagascar-I-973, Japan-N-1278, Madagascar-N-1000, India-UN-1345, Sardinia-U-1381, Global-I-1404, Spain-U- 1454, Spain-U-1455, Fiji-A-1521, Global- CD-1611, Croatia-N-1747, Romania-U- 1905, Sardinia-U-1917, Nepal-A-1932, Italy-N-1842, Australia-Q-1123, Australia- W-1977, Bulgaria-W-1977, Cook Islands- W-1977, Croatia-W-1977, Cyprus-W-1977, France-W-1977, Greece-W-1977, India-W-1977, Italy-W-1977, Japan-W-1977, Malta- W-1977, Turkey-W-1977."
	Dave's Garden. (2020). Jujube Species, Chinese Date, Common Jujube, Korean Date, Red Date - Ziziphus jujuba. https://davesgarden.com/guides/pf/go/50048/. [Accessed 3 Jun 2020]	[Reported as a landscaping weed by homeowners] "On Feb 19, 2018, TEDW789 from San Diego, CA wrote: bought a property that had this tree removed. but its suckers and roots run all over the property. i have tried uprooting as much as i can find. while it hasn't sprouted anything in a couple of years, i'm still digging up live roots. like others have said, "invasive" is an understatement. don't plant this thing unless you want it around forever."... "On May 20, 2013, skdunn from Fort Worth, TX wrote: These trees although they get tall are very invasive. They put out shoots from the root system. We bought a house with three of them in the back yard . I have them coming up all over the yard . Can't get rid of them without killing the big trees. They also have thorns especially when they are small " ... "On Jul 22, 2010, slinger53 from Alamogordo, NM wrote: I came to this site to find out how to kill it. The discription says it's invasive, an UNDERSTATEMENT it grows from the root like St. Augustine grass. When I moved into this house my next door neighbor had a small grove in the corner of his yard. Well we bought that property about 8 years ago and have off and on been trying to get rid of them. The roots invaded my yard and ran about thirty feet. I've been digging them up and like grass if you leave the smallest bit of root here it comes again. And the thorns are rediculous. Long thin and tend to break off after penetration so you can get a nasty infection. And oh yea it grows real well here in New Mexico Alamogordo Area. Just lay a root in the ground and water it a couple of times and its off."

303	Agricultural/forestry/horticultural weed	
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Cereals" [Possibly, but unable to corroborate impacts]

Qsn #	Question	Answer
	Binggeli, P. (2003). Introduced and invasive plants. Pp. 257 -268 in Goodman, S.M. & Benstead, J.P. (eds.). The Natural History of Madagascar. University of Chicago Press, Chicago	[Invades overgrazed pastures] "Overgrazing of pasture may result in the encroachment of herbaceous communities by woody plants including introduced species such as Acacia farnesiana, Lantana camara, and Ziziphus jujuba (Koechlin 1993). The latter species is extremely common in the west of the island, often forming pure stands (Capuron 1965)."

304	Environmental weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[Disturbance and potential crop weed] "Weed of: Cereals References: Australia-CN-468, Global-N- 85, Japan-N-287, Pacific-W-621, Japan-N- 794, Spain-W-807, France-N-1006, France- N-1006, Malta-N-1006, Turkey-N-1006, United States of America-I-979, United States of America-NW-939, Europe-N-819, Madagascar-I-973, Japan-N-1278, Madagascar-N-1000, India-UN-1345, Sardinia-U-1381, Global-I-1404, Spain-U- 1454, Spain-U-1455, Fiji-A-1521, Global- CD-1611, Croatia-N-1747, Romania-U- 1905, Sardinia-U-1917, Nepal-A-1932, Italy-N-1842, Australia-Q-1123, Australia- W-1977, Bulgaria-W-1977, Cook Islands- W-1977, Croatia-W-1977, Cyprus-W-1977, France-W-1977, Greece-W-1977, India-W- 1977, Italy-W-1977, Japan-W-1977, Malta- W-1977, Turkey-W-1977."

305	Congeneric weed	y
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Ziziphus mauritiana … Weed of: Pastures" … "Ziziphus mucronata Willd. subsp. mucronata … Weed of: Pastures" … "Ziziphus nummularia … Weed of: Cotton, Orchards & Plantations"
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[May be a synonym of Z. jujuba] "Ziziphus mauritiana … The rapidly growing shrub forms dense and impenetrable thickets affecting wildife, limiting access to water and displacing native plants. In Australia, it builds a continuous shrub layer within formerly open eucalypt woodlands. The plant suckers from roots and resprouts even after complete removal of the shoots, e.g. after fires (Grice, 1996, 1997, 2002)."

401	Produces spines, thorns or burrs	y
	Source(s)	**Notes**
	Godfrey, R. K. (1988). Trees, Shrubs, and Woody Vines of Northern Florida and Adjacent Georgia and Alabama. University of Georgia Press, Athens, GA	"Some nodes of the extension shoots bear a pair of short, sharp nonpersistent spines."

Qsn #	Question	Answer
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2007. Flora of China. Vol. 12 (Hippocastanaceae through Theaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Spinose or unarmed] "Trees small, rarely shrubs, deciduous, to 10 m tall, spinose or unarmed. Bark brown or gray-brown, with long reduced branches, without buds; branchlets (new branches) purple-red or gray-brown, flexuose, smooth, with 2 stipular spines or not; long spines erect, to 3 cm, stout; short spines recurved, developed from old branches; annual branchlets pendulous, green, solitary or 2–7-fascicled on short shoots. Stipular spines slender, caducous; petiole 1–6 mm, or to 1 cm on long shoots, glabrous or sparsely puberulent; leaf blade abaxially pale green, adaxially dark green, ovate, ovate-elliptic, or elliptic-oblong, 3–7 × 1.5–4 cm, papery, abaxially ± puberulent on major veins or glabrous, adaxially glabrous, 3-veined from base, base slightly asymmetric, subrounded, margin crenate-serrate, apex obtuse or rounded, rarely acute, mucronulate."

402	Allelopathic	
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"In its tree form with a dense, spreading crown, it kills the grass and other vegetation underneath it."
	Elaloui, M., Ghazghazi, H., Ennajah, A., Ben, Y., Ben, O., & Laamouri, A. (2017). Allelopathic effects of Ziziphus jujuba and Z. lotus leaf extracts on Triticum durum and Lens culinaris. Tunisian Journal of Plant Protection, 12(1), 1-10	[Possibly Yes. Demonstrated using extracts] "Abstract : Ziziphus species were known for their widespread uses in folk medicine. This work aimed to determine the secondary metabolites (total phenols, flavonoïds, and tannins) of aqueous leaf extracts of two Ziziphus species (Z. jujuba and Z. lotus) from different origins (Mahres, Mahdia, Kairouan, or Rouhia) and their allelopathic effects on Triticum durum and Lens culinaris. The germination percentage, plumule and radicle lengths were recorded after seven days. Total phenols and flavonoïds varied from 10 to 14.03 mg EAG/g DW (total phenols) and from 4.63 to 7 mg QE/g DW (flavonoïds) for Z. jujuba and Z. lotus, respectively. Tannin contents varied from 4.4 (Z. jujuba) to 6 mg CE/g DW (Z. lotus). The radicle length was strongly inhibited by 69.38% in T. durum and by 43.29% in L. culinaris especially when treated with Ziziphus spp. leaf extracts at 100 mg/ml concentration. Root length of T. durum was more inhibited (86.75%) by Z. lotus leaf extract than that of L. culinaris. High levels of phenolic compounds detected especially in Z. lotus leaf extract could justify its inhibitory effect on germination rate and seedling length. Z. lotus leaf extract could be used as herbicide to delete undesirable weeds."

403	Parasitic	n
	Source(s)	**Notes**
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2007. Flora of China. Vol. 12 (Hippocastanaceae through Theaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Trees small, rarely shrubs, deciduous, to 10 m tall, spinose or unarmed." [Rhamnaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"The branches are lopped for cattle fodder, and leaves are fed to tasar silkworms. It is cultivated throughout its range of occurrence for its fruit, and the wild fruits are also edible and eaten by wildlife. In some localities the lac insect is grown on the tree. It is readily browsed by goats and constitutes good camel fodder (Hanjara, 1984; Jin et al., 1995)."

405	Toxic to animals	n
	Source(s)	**Notes**
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	"Ethanolic jujube fruit extract was found to be devoid of any significant toxic effects as evaluated by acute toxicity test observations made for 24 h and chronic treatment of animals for 3 months (Shah et al. 1989a) . During acute toxicity, test observations were made for 24 h while the animals were treated for 3 months in chronic treatment. No significant changes in external morphological changes, visceral toxicity, haematological changes, spermatogenic dysfunction, besides effects on average body weight and vital organ weight were recorded."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	[No evidence] "The branches are lopped for cattle fodder, and leaves are fed to tasar silkworms. It is cultivated throughout its range of occurrence for its fruit, and the wild fruits are also edible and eaten by wildlife. In some localities the lac insect is grown on the tree. It is readily browsed by goats and constitutes good camel fodder (Hanjara, 1984; Jin et al., 1995)."
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	Outlaw, W. H., et al. (2002). The jujube (Ziziphus jujuba Mill.), a multipurpose plant. Economic Botany, 56(2), 198-200	"Finally, the jujube fruit is a host of the Caribbean fruit fly (Anastrepha suspensa) (Wayne Sherman pers. comm.), which is present in restricted areas of the U. S."
	Gilman, E.F. & Watson, D.G. (2006). Ziziphus jujuba: Chinese Date. ENH-836. Revised. University of Florida, IFAS, Gainesville, FL. http://edis.ifas.ufl.edu.. [Accessed 3 Jun 2020]	"No pests or diseases are of major concern."
	Missouri Botanical Garden. (2020). Ziziphus jujuba. http://www.missouribotanicalgarden.org. [Accessed 3 Jun 2020]	"No serious insect or disease problems."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence. Medicinal uses] "edible drupe dark reddish-brown, a single stone surrounded by fleshy pulp" … "Used in Ayurveda, Unani and Sidha. Stem bark decoction used to check diarrhea. Leaves febrifuge; leaves paste applied on the affected portion to cure scorpion sting. Fruit used for poor appetite, cough, fatigue, loose bowels, insomnia, hysteria, night sweats."
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	[No evidence] "Ethanolic jujube fruit extract was found to be devoid of any significant toxic effects as evaluated by acute toxicity test observations made for 24 h and chronic treatment of animals for 3 months (Shah et al. 1989a) . During acute toxicity, test observations were made for 24 h while the animals were treated for 3 months in chronic treatment. No significant changes in external morphological changes, visceral toxicity, haematological changes, spermatogenic dysfunction, besides effects on average body weight and vital organ weight were recorded."

408	Creates a fire hazard in natural ecosystems	
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"The plants have great power of recovery from any kind of injury including fire." [Recovers from fire, suggesting it may occur in fire prone habitats, and could increase fire risk if it achieves high density or thick cover]

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	**Notes**
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	"Chinese jujube is fairly adaptable, but should be grown in full sun as they are shade intolerant."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"The tree is a light demanding species, frost hardy and withstands drought well."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	"It is adaptable on a wide diversity of soils including saline and alkaline soils but prefers a sandy-loamy, well-drained soil. It does not perform well in heavy, poorly drained soils."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Z. jujuba grows well on sandy or shingle alluvium and on arable land. It also grows on a variety of soils, including laterite, black cotton soil, and even moderately saline soil, while it appears on open wastelands on poor dry ground."

Qsn #	Question	Answer
411	**Climbing or smothering growth habit**	**n**
	Source(s)	**Notes**
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2007. Flora of China. Vol. 12 (Hippocastanaceae through Theaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Trees small, rarely shrubs, deciduous, to 10 m tall, spinose or unarmed."

412	**Forms dense thickets**	**y**
	Source(s)	**Notes**
	Binggeli, P. (2003). Introduced and invasive plants. Pp. 257 -268 in Goodman, S.M. & Benstead, J.P. (eds.). The Natural History of Madagascar. University of Chicago Press, Chicago	"Overgrazing of pasture may result in the encroachment of herbaceous communities by woody plants including introduced species such as Acacia farnesiana, Lantana camara, and Ziziphus jujuba (Koechlin 1993). The latter species is extremely common in the west of the island, often forming pure stands (Capuron 1965)."

501	**Aquatic**	**n**
	Source(s)	**Notes**
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2007. Flora of China. Vol. 12 (Hippocastanaceae through Theaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Terrestrial] "Trees small, rarely shrubs, deciduous, to 10 m tall, spinose or unarmed." … "Mountains, hills, sunny dry slopes, plains, also widely cultivated; below 1700 m."

502	**Grass**	**n**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 31 May 2020]	Family: Rhamnaceae Tribe: Paliureae

503	**Nitrogen fixing woody plant**	**n**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 31 May 2020]	Family: Rhamnaceae Tribe: Paliureae

Qsn #	Question	Answer
504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2007. Flora of China. Vol. 12 (Hippocastanaceae through Theaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Trees small, rarely shrubs, deciduous, to 10 m tall, spinose or unarmed."

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	[No evidence] "It is found in many countries in Asia, including India and Pakistan, and in Europe and America, either wild or naturalized, up to altitudes of 1800 m." … "Z. jujuba regenerates readily and profusely from seed under natural conditions."

602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Z. jujuba regenerates readily and profusely from seed under natural conditions."

603	**Hybridizes naturally**	**y**
	Source(s)	**Notes**
	Asatryan, A., & Tel-Zur, N. (2014). Intraspecific and interspecific crossability in three Ziziphus species (Rhamnaceae). Genetic Resources and Crop Evolution, 61 (1), 215-233	[Natural hybridization demonstrated to be possible] "Abstract Three cultivated species of Ziziphus Mill. [Z. jujuba Mill., Z. mauritiana Lam. and Z. spinachristi (L.) Willd.] comprising a total of seventeen cultivars/genotypes were selected for a mating system study. Phenological stage determination showed an overlap in blooming between the three species during June. Intraspecific cross compatibility was evaluated for Z. jujuba and Z. mauritiana, and interspecific crosses between the three species were carried out during two flowering seasons." … "Viable embryos were obtained from Z. mauritiana x Z. jujuba, Z. mauritiana x Z. spina-christi and Z. spina-christi x Z. mauritiana crosses. Putative hybrids from these crosses were germinated in vitro, and the resultant plantlets were studied using flow cytometric analysis. Indications of true hybrid origin were obtained based on total 2C DNA content of plantlets, but they died during the hardening-off process. This study showed that gene flow among these species is possible, thus increasing the potential that interspecific crosses can be used for genetic crop improvement." … "Our results indicate interspecific cross pollination between Ziziphus species may be possible in natural conditions."

604	**Self-compatible or apomictic**	**n**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Asatryan, A., & Tel-Zur, N. (2014). Intraspecific and interspecific crossability in three Ziziphus species (Rhamnaceae). Genetic Resources and Crop Evolution, 61 (1), 215-233	"Although Z. mucronata Willd., Z. spina-christi, Z. jujuba and Z. mauritiana have all been reported to possess self-incompatibility (SI) systems (Zietsman and Botha 1992; Asatryan and Tel-Zur 2013), few Z. jujuba and Z. mauritiana genotypes were successfully self-pollinated but only seedless fruits were obtained (Chiarugi 1930; Lyrene 1983; Tian and Ma 1987; Asatryan and Tel-Zur 2013)." … "reliable calculations of the respective blooming periods of the Z. mauritiana and Z. jujuba cultivars and previous information regarding the anthesis group of each cultivar will be of great value to orchard design, especially due to the self-incompatibility system that exists in these species (Asatryan and Tel-Zur 2013)."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	McGregor, S. E. (1976). Insect Pollination of Cultivated Crop Plants. Agricultural Research Service, USDA, Washington, D.C.	"Ackerman (1961) stated that flies and beetles were of no value as pollinators of jujubes. He used honey bees."
	Pitchandikulam Forest Virtual Herbarium. (2020). Ziziphus jujuba - Reproduction & Dispersal. http://www.pitchandikulam-herbarium.org. [Accessed 4 Jun 2020]	"Ziziphus jujuba is pollinated by a wide variety of insects."

606	Reproduction by vegetative fragmentation	y
	Source(s)	**Notes**
	Outlaw, W. H., et al. (2002). The jujube (Ziziphus jujuba Mill.), a multipurpose plant. Economic Botany, 56(2), 198-200	"First, the tree is potentially weedy because it forms root sprouts."
	Dave's Garden. (2020). Jujube Species, Chinese Date, Common Jujube, Korean Date, Red Date - Ziziphus jujuba. https://davesgarden.com/guides/pf/go/50048/. [Accessed 3 Jun 2020]	"On Jul 22, 2010, slinger53 from Alamogordo, NM wrote: … The roots invaded my yard and ran about thirty feet. I've been digging them up and like grass if you leave the smallest bit of root here it comes again. " … "And oh yea it grows real well here in New Mexico Alamogordo Area. Just lay a root in the ground and water it a couple of times and its off."

Qsn #	Question	Answer
607	**Minimum generative time (years)**	**1**
	Source(s)	**Notes**
	University of Arizona Campus Arboretum. (2015). Edible Landscapes. https://arboretum.arizona.edu. [Accessed 4 Jun 2020]	"Chinese jujubes survive in a variety of well drained soils and prefer warm temperatures. The plant grows fast (only 3-4 years to produce fruit) and spreads far, so large amounts of space for growing is recommended."
	Gilman, E.F. & Watson, D.G. (2006). Ziziphus jujuba: Chinese Date. ENH-836. Revised. University of Florida, IFAS, Gainesville, FL. http://edis.ifas.ufl.edu.. [Accessed 4 Jun 2020]	"Even young, two-year-old trees are able to produce these delectable treats but be forewarned that these fruits can create quite a litter problem."
	Bonner, F.T. & Karrfalt, R.P. (eds.). 2008. The Woody Plant Seed Manual. USDA FS Agriculture Handbook 727. Government Printing Office, Washington, D.C.	"Trees bear fruit as early as 1 to 4 years after planting (Lyrene 1979)."

701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	**n**
	Source(s)	**Notes**
	Pitchandikulam Forest Virtual Herbarium. (2020). Ziziphus jujuba - Reproduction & Dispersal. http://www.pitchandikulam-herbarium.org. [Accessed 4 Jun 2020]	"The seeds of Ziziphus jujuba are mainly dispersed by frugivorous birds and mammals."

702	**Propagules dispersed intentionally by people**	**y**
	Source(s)	**Notes**
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 5, Fruits. Springer, Dordrecht	"Chinese jujube originated in China where they have been cultivated for more than 4,000 years. It was distributed beyond China centuries ago and today it is cultivated to some extent in Russia, northern Africa, southern Europe, the Middle East, Caribbean and the southwestern United States. It is widely cultivated and naturalized in Eurasia."
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2007. Flora of China. Vol. 12 (Hippocastanaceae through Theaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"cultivated in Africa, Asia, Europe, and North and South America"

Qsn #	Question	Answer
703	**Propagules likely to disperse as a produce contaminant**	**n**
	Source(s)	**Notes**
	Binggeli, P. (2003). Introduced and invasive plants. Pp. 257 -268 in Goodman, S.M. & Benstead, J.P. (eds.). The Natural History of Madagascar. University of Chicago Press, Chicago	"Fruits are dispersed by mammals and birds."
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2007. Flora of China. Vol. 12 (Hippocastanaceae through Theaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence, and unlikely with relatively large, few-seeded drupes] "Drupe red at maturity, turning red-purple, oblong or narrowly ovoid, 2–3.5 cm, (0.5–)1.5–2 cm in diam.; mesocarp fleshy, thick, sweet- or sour-tasting; stone acute or obtuse at both ends, 2-loculed, 1- or 2-seeded; fruiting pedicel 2–5 mm or longer. Seeds compressed-orbicular, ca. 1 × 0.8 cm"

704	**Propagules adapted to wind dispersal**	**n**
	Source(s)	**Notes**
	Nelson, G., Earle, C.J. & Spellenberg, R. (2014). Trees of Eastern North America. Princeton University Press, Princeton, NJ	"Fruit Rounded, juicy, edible drupe, 2–3.5 cm long, about 2 cm diam., with 1 or 2 stones; red or purplish red at maturity, in autumn."
	Binggeli, P. (2003). Introduced and invasive plants. Pp. 257 -268 in Goodman, S.M. & Benstead, J.P. (eds.). The Natural History of Madagascar. University of Chicago Press, Chicago	"Fruits are dispersed by mammals and birds."

705	**Propagules water dispersed**	**n**
	Source(s)	**Notes**
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2007. Flora of China. Vol. 12 (Hippocastanaceae through Theaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence but unlikely. Buoyancy of fruit unknown, but not identified as a riparian species] "Mountains, hills, sunny dry slopes, plains, also widely cultivated; below 1700 m."

706	**Propagules bird dispersed**	**y**
	Source(s)	**Notes**
	Binggeli, P. (2003). Introduced and invasive plants. Pp. 257 -268 in Goodman, S.M. & Benstead, J.P. (eds.). The Natural History of Madagascar. University of Chicago Press, Chicago	"Fruits are dispersed by mammals and birds."

707	**Propagules dispersed by other animals (externally)**	**n**
	Source(s)	**Notes**
	Binggeli, P. (2003). Introduced and invasive plants. Pp. 257 -268 in Goodman, S.M. & Benstead, J.P. (eds.). The Natural History of Madagascar. University of Chicago Press, Chicago	"Fruits are dispersed by mammals and birds." [It may be possible that seed caching rodents could disperse some seeds after consuming pulp or depredating some seeds, but may not be an important dispersal mode]

708	**Propagules survive passage through the gut**	**y**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Binggeli, P. (2003). Introduced and invasive plants. Pp. 257 -268 in Goodman, S.M. & Benstead, J.P. (eds.). The Natural History of Madagascar. University of Chicago Press, Chicago	"Fruits are dispersed by mammals and birds." [Presumably Yes]
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"It is cultivated throughout its range of occurrence for its fruit, and the wild fruits are also edible and eaten by wildlife."

801	Prolific seed production (>1000/m2)	n
	Source(s)	**Notes**
	Bonner, F.T. & Karrfalt, R.P. (eds.). 2008. The Woody Plant Seed Manual. USDA FS Agriculture Handbook 727. Government Printing Office, Washington, D.C.	[Fruits relatively large and few-seeded] "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"

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	**Notes**
	Bonner, F.T. & Karrfalt, R.P. (eds.). 2008. The Woody Plant Seed Manual. USDA FS Agriculture Handbook 727. Government Printing Office, Washington, D.C.	"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)."
	Horticultural Impex. (2020). Ziziphus jujuba. http://www.ehorticulture.com. [Accessed 4 Jun 2020]	"Seed Longevity 1 year"
	Wang, N., Jiao, J. Y., Jia, Y. F., & Wang, D. L. (2011). Seed persistence in the soil on eroded slopes in the hilly-gullied Loess Plateau region, China. Seed Science Research, 21(4), 295-304	[Classified as having a transient seed bank] "Thompson et al. (1993) classified the seeds in the soil into three classes: transient, persisting in the soil for less than 1 year; short-term persistent, persisting for more than 1 but less than 5 years; and long-term persistent, persisting for at least 5 years." … "Table 1. The traits of seeds, the soil seed-bank and the standing vegetation of all the observed species in the study plots (P, persistent seed-bank; T, transient seed-bank;'–', species was not defined due to it is rarity in the soil seed-bank and standing vegetation; '*', species capable of vegetative propagation)" [Ziziphus jujube var. spinosa* - Persistence = T, transient seed-bank]

Qsn #	Question	Answer
803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	Global Invasive Species Database. (2020). Ziziphus mauritiana. http://issg.org. [Accessed 4 Jun 2020]	[Methods would likely also work on Z. jujuba] "Chemical: Effective herbicides include triclopyr/picloram in a 1:60 herbicide-diesel mixture applied as a basal bark spray during times of active plant growth. The same chemical can be applied to cut stumps ay any time of year. It may also be effective in a high volume spray mixture of 0.35L herbicide:100L water to actively growing regrowth. Soil application of picloram-triethanolamine at 35-45 g/sq m can be used on dense infestations."

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"The plants have great power of recovery from any kind of injury including fire. In its tree form with a dense, spreading crown, it kills the grass and other vegetation underneath it. It coppices and pollards and produces root suckers."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits
• Broad climate suitability, and elevation range exceeds 1000 m, demonstrating environmental versatility
• Naturalized in temperate to subtropical regions
• Widely naturalized outside native range (but no evidence in the Hawaiian Islands to date)
• Regarded as weedy and invasive in landscapes and potentially in agricultural settings
• Other species in genus are invasive
• Spiny forms exist
• Potentially allelopathic
• Tolerates many soil types
• May form pure stands
• Reproduces by seeds and vegetatively by suckering and root fragments
• Hybridizes with other species
• Able to reach maturity in 1-4 years
• Seeds dispersed by birds and mammals, and intentionally spread by people
• Able to coppice and resprout after cutting and fires

Low Risk Traits
• A temperate species that may be more of a risk to higher elevation, cooler regions of tropical and subtropical islands
• Spineless forms exist
• Provides fodder for livestock
• Non-toxic, with edible fruit and medicinal uses
• Light demanding (deep shade may limit ability to spread)
• Self-incompatible
• Transient seed bank does not persist beyond one year
• Herbicides may provide effective control if needed

Second Screening Results for Tree/tree-like shrubs

(A) Shade tolerant or known to form dense stands?> Yes. Capable of forming dense stands. A light demanding tree, and presumably shade intolerant
(B) Bird or clearly wind-dispersed?> Dispersed by birds
(C) Life cycle <4 years? Yes. Capable of reaching maturity as early as one year
Outcome = Reject (High Risk)