

Family: *Pinaceae*

Taxon: *Cedrus deodara*

Synonym: *Cedrus deodara* var. *aurea*
Pinus deodara Roxburgh
Cedrus libani A. Richard subsp. *deodara* (Ro)

Common Name: Deodar cedar
Himalayan cedar

Questionnaire :	current 20090513	Assessor:	Chuck Chimera	Designation: L
Status:	Assessor Approved	Data Entry Person:	HPWRA OrgData	WRA Score 0
101	Is the species highly domesticated?		y=-3, n=0	n
102	Has the species become naturalized where grown?		y=1, n=-1	
103	Does the species have weedy races?		y=1, n=-1	
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)	Low
202	Quality of climate match data		(0-low; 1-intermediate; 2-high) (See Appendix 2)	Intermediate
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	n
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)	n
303	Agricultural/forestry/horticultural weed		n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed		n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed		n=0, y = 1*multiplier (see Appendix 2)	
401	Produces spines, thorns or burrs		y=1, n=0	n
402	Allelopathic		y=1, n=0	
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		y=1, n=0	
407	Causes allergies or is otherwise toxic to humans		y=1, n=0	
408	Creates a fire hazard in natural ecosystems		y=1, n=0	y
409	Is a shade tolerant plant at some stage of its life cycle		y=1, n=0	y
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	
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	>3
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	y
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)	y=1, n=-1	
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	
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	n
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation: L

WRA Score 0

Supporting Data:

101	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Is the species highly domesticated? No] "Although <i>C. deodara</i> has a very large natural range, growing over a range of habitats, no study has apparently been carried out to determine genetic variation in this species for breeding purposes. A large number of ornamental varieties exist, for needle colour ('Albospica', 'Argentea', 'Aurea', 'Erecta', 'Flava', 'Glaucula'), for dwarf forms ('Compacta', 'Hesse', 'Nana', 'Pygmy'), for pendulous branches ('Pendula', 'Repandens') or for vertical growth ('Crassifolia', 'Fastigiata', 'Robusta', 'Tristis', 'Wiesemannii') (Vidakovic, 1991)."
102	2012. WRA Specialist. Personal Communication.	NA
103	2012. WRA Specialist. Personal Communication.	NA
201	2001. Takos, I./Merou, T.. Effect of Storage Conditions and Seed Treatment on Germination of <i>Cedrus deodara</i> LOUD. and <i>C. libani</i> A. RICH.. <i>Silvae Genetica</i> . 50(5–6): 205-208.	[Species suited to tropical or subtropical climate(s) 0-Low] "The seeds of <i>Cedrus deodara</i> and <i>C. libani</i> species were stored during the winter at various temperatures." ... "during the winter in a basement inside common linen sacks. The following spring, the effect of the storage temperatures as well as the effect of the seed treatment (cold stratification and soaking in water) on germination percentage and germination value were investigated." ... "The soaking of the seeds in water for 3 hours and the cold stratification at +5°C±1°C for 15 or 30 days resulted in a higher seed germination value." [Seeds require cold stratification]
201	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Species suited to tropical or subtropical climate(s) 0-Low] " <i>C. deodara</i> forests are found naturally throughout the western Himalayan ranges in Afghanistan, Pakistan and India at an elevation of 1200 to 3300 m, but most commonly at 1800 to 2550 m. They occur on moderate to precipitous slopes as well as on level ground. Deodar generally dominates cool northern slopes and is very frequently found on rocky precipitous slopes where it usually forms pure crops of considerable extent (Troup, 1921)."
202	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Quality of climate match data? 1-Intermediate] " <i>C. deodara</i> forests are found naturally throughout the western Himalayan ranges in Afghanistan, Pakistan and India at an elevation of 1200 to 3300 m, but most commonly at 1800 to 2550 m. They occur on moderate to precipitous slopes as well as on level ground. Deodar generally dominates cool northern slopes and is very frequently found on rocky precipitous slopes where it usually forms pure crops of considerable extent (Troup, 1921)." ... "Treatment of seed with mycorrhizal fungi significantly increases plant biomass (Shah et al., 1998). Seeds stratified at 5°C in moist sand for 30 days also give a much higher percentage germination (44.7%) than those stratified for 15 days (16%) or not at all (11.3%) (Blomme and Degeyter, 1978)." [Seeds benefit from cold stratification]
203	1996. Rowell, R.J.. <i>Ornamental Conifers for Australian Gardens</i> . UNSW Press, Sydney	[Broad climate suitability (environmental versatility)? Yes] "The Indian Cedar is one of the most adaptable of the conifers, thriving in a broad range of climates and soil types, given the basic essential of good drainage."
203	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Broad climate suitability (environmental versatility)? Yes] " <i>C. deodara</i> naturally grows normally in areas at 800-3100 m altitude, but suffers frost injury and inhibited growth at 3200 m and at temperatures of less than -25°C. A mild climate and an altitude of around 2000 m is thought to be ideal for this species. It does not grow in the heavy rainfall areas of Pakistan (Parker, 1956). Ectomycorrhizas are found associated with <i>C. deodara</i> trees (Sharma and Mishra, 1982)." [Broad elevation range]
204	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Native or naturalized in regions with tropical or subtropical climates? No] " <i>C. deodara</i> forests are found naturally throughout the western Himalayan ranges in Afghanistan, Pakistan and India at an elevation of 1200 to 3300 m, but most commonly at 1800 to 2550 m. They occur on moderate to precipitous slopes as well as on level ground. Deodar generally dominates cool northern slopes and is very frequently found on rocky precipitous slopes where it usually forms pure crops of considerable extent (Troup, 1921)."
205	1980. Skolmen, R.G.. <i>Plantings on the forest reserves of Hawaii: 1910–1960</i> . Institute of Pacific Islands Forestry, Pacific Southwest Forest & Range Experiment Station, US Forest Service, Honolulu, HI	[Does the species have a history of repeated introductions outside its natural range? Yes] At least 102 trees documented in plantings on Maui (2 trees) and Hawaii Islands (100 trees) between the years of 1910 and 1932
205	1998. Medeiros, A.C./Loope, L.L./Chimera, C.G.. <i>Flowering Plants and Gymnosperms of Haleakala National Park</i> . Technical Report 120. Pacific Cooperative Studies Unit, Honolulu, HI	[Does the species have a history of repeated introductions outside its natural range? Yes] "West slope, planted at Hosmer Grove (6800 ft) in 1909-1911 (Park records). Planted and not reproducing in the Park."

205	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Does the species have a history of repeated introductions outside its natural range? Yes] "It is widely planted in Europe as an ornamental tree, and a number of cultivars exhibit variety in needle and shoot colour, as well as in habit (Vidakovic, 1991)."
301	2004. Richardson, D.M./Rejmánek, M.. Conifers as invasive aliens: a global survey and predictive framework. Diversity and Distributions. 10: 321–331.	[Naturalized beyond native range? Yes. SE US] "Appendix List of naturalized or invasive (in bold) conifers (Pinopsida), based on hundreds of published and unpublished sources and the unpublished data and personal observation of the authors over more than a decade." ... "C. deodara (USA (SE))"
301	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Naturalized beyond native range? Yes. China] "C. deodara has been introduced in many countries all over the world in research plots, arboreta and amenity/ornamental/production plantations (Savich et al., 1991; Ares and Marlats, 1995; Baldassari, 1996; Saito, 1997). It appears to be naturalized in China, where large plantations are grown (Ren et al., 1994; Jin et al., 1996)."
301	2007. Henderson, L.. Invasive, naturalized and casual alien plants in southern Africa: a summary based on the Southern African Plant Invaders Atlas (SAPIA). Bothalia. 37(2): 215–248.	[Naturalized beyond native range? Possibly South Africa] "APPENDIX 4.—Summary of results for all naturalized and casual alien plants in the study area, Savanna Biome, Fynbos Biome, Forest habitats, Grassland Biome, Nama-Karoo Biome, Succulent Karoo Biome and watercourse/wetland habitats" ... "Cedrus deodara ?#" ... "#, casual alien plants: occurring outside cultivation; some species flourishing but less than 10 years of records in SAPIA precludes being categorized as 'naturalized' (Pyšek et al. 2004)."
301	2008. Heenan, P.B./de Lange, P.J./Cameron, E.K./Parris, B.S.. Checklist of dicotyledons, gymnosperms, and pteridophytes naturalised or casual in New Zealand: Additional records 2004–06. New Zealand Journal of Botany. 46(2): 257-283.	[Naturalized beyond native range? Possibly New Zealand] "Cedrus deodara Loud. NEW RECORD: CHR 569990, P. B. Heenan, 1 Feb 2004, Canterbury, Christchurch, Westmorland. NOTES: Cultivation escape. Three seedlings established under adult trees."
301	2010. Marco, A./Lavergne, S./Dutoit, T./Bertaudiere-Montes, V.. From the backyard to the backcountry: how ecological and biological traits explain the escape of garden plants into Mediterranean old fields. Biological Invasions. 12: 761–779.	[Naturalized beyond native range? No evidence] "Table 5 List of the perennial alien plant species escaped (=1) and not escaped (=0) in abandoned agricultural lands of Lauris village" "Cedrus deodara" ... "not escaped (=0)"
302	2007. Randall, R.P.. Global Compendium of Weeds - Cedrus deodara [Online Database]. http://www.hear.org/gcw/species/cedrus_deodara/	[Garden/amenity/disturbance weed? No] No evidence
303	2007. Randall, R.P.. Global Compendium of Weeds - Cedrus deodara [Online Database]. http://www.hear.org/gcw/species/cedrus_deodara/	[Agricultural/forestry/horticultural weed? No] No evidence
304	2002. Zalba, S.M./Villamil, C.B.. Woody plant invasion in relictual grasslands. Biological Invasions. 4: 55–72.	[Environmental weed? No evidence in the Ernesto Tornquist Provincial Park, Argentina] "Among the considered stands, only a Cedrus deodara stand (No. 3) can be a priori discarded as being an invasive species posing a threat to the reserve, because it is apparently in decline, almost without saplings and young trees, not having expanded its distribution over the last thirty years (Table 6)."
304	2007. Randall, R.P.. Global Compendium of Weeds - Cedrus deodara [Online Database]. http://www.hear.org/gcw/species/cedrus_deodara/	[Environmental weed? Questionably]
305	2004. Richardson, D.M./Rejmánek, M.. Conifers as invasive aliens: a global survey and predictive framework. Diversity and Distributions. 10: 321–331.	[Congeneric weed? Potentially] "Cedrus atlantica (France; New Zealand; Spain)" [Naturalized]
305	2007. Randall, R.P.. Global Compendium of Weeds - Index [Online Database]. http://www.hear.org/gcw/	[Congeneric weed? Possibly] Cedrus atlantica described as naturalized and possibly weedy. Cedrus libani described as naturalized. Evidence of significant negative impacts not found.
401	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Produces spines, thorns or burrs? No] "A very large evergreen tree, attaining a height to 65 m and more than 4 m stem diameter, with horizontal or slightly ascending or descending branches, which are not whorled but arise irregularly from the stem (Troup, 1921). Up to middle age, the trees have conical crowns with definite leading shoots, but in later life, their crowns become rounded or broad and flat with horizontal branches. The bark is dark greyish brown, with vertical and diagonal cracks dividing it into irregular oblong scales (Troup, 1921; Parker, 1956). Shoots are dimorphic. Foliage - Foliage is silvery or silvery-blue. Needles are acuminate, solitary, stiff, sharp-pointed, 25 37 mm long (Vidakovic (1991) states that they may be 30-50 m long), on normal long shoots spirally arranged, and on short arrested shoots in pseudowhorls (Parker, 1956). "

402	1999. Singh, H.P./Kohli, R.K./Batish, D.R./Kaushal, P.S.. Allelopathy of Gymnospermous Trees. Journal of Forest Research. 4: 245-254.	[Allelopathic? Possibly] "Species richness of floor vegetation was reduced, and leachates of leaf, litter and wood, drip water inhibited germination and growth."
402	2002. Zalba, S.M./Villamil, C.B.. Woody plant invasion in relictual grasslands. Biological Invasions. 4: 55-72.	[Allelopathic? Possibly No] "We recorded significant decreases ($P < 0.05$) in total plant species richness (native and exotic) for all the studied stands relative to their corresponding controls in native grassland. The only exception corresponded to the <i>Cedrus deodara</i> in stand no. 2, which showed an increase that was, however, not statistically significant ($P > 0.1$)." [Supports more species in understory, so does not appear to be allelopathic]
402	2006. Kumar, M.. Phytotoxic effects of agroforestry tree crops on germination and radicle growth of some food crops of Mizoram. Lyonia. 11(2): 83-89.	[Allelopathic? Potentially] "Many other species also reported for allelopathic to plant growth are <i>Celtis laevigata</i> , <i>Rhododendron albiflorum</i> , <i>Grevillea robusta</i> , <i>Quercus falcata</i> , <i>Quercus alba</i> (Rice, 1974, 1979), <i>Pinus roxburghii</i> , <i>Cedrus deodara</i> , <i>Quercus leucotrichophora</i> , <i>Myrica esculenta</i> (Melkania, 1983)."
403	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Parasitic? No] "A very large evergreen tree, attaining a height to 65 m and more than 4 m stem diameter, with horizontal or slightly ascending or descending branches, which are not whorled but arise irregularly from the stem (Troup, 1921)." [Pinaceae. Not parasitic]
404	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Unpalatable to grazing animals? No] "C. deodara is browsed by goats, bears, porcupines and monkeys."
404	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, (http://www.worldagroforestry.org/af/treedb/)	[Unpalatable to grazing animals? No] "The deodar trees are damaged by snow, fire and browsing by goats."
405	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Toxic to animals? No] "C. deodara is browsed by goats, bears, porcupines and monkeys."
406	2012. Missouri Botanical Garden. Gardens & Gardening > Your Garden > Plant Finder > Plant Details - <i>Cedrus deodara</i> . http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/b442/cedrus-deodara.aspx	[Host for recognized pests and pathogens? No] "No serious insect or disease problems. Tip blight and root rot may occur. Winter hardiness is a concern in the St. Louis area where consideration should be given to planting a cultivar such as 'Shalimar' that has slightly better hardiness than the species. Notwithstanding the winter hardiness problems, these plants usually struggle in the St. Louis area where environmental conditions do not favor most conifers."
407	2000. Rawat, A./Singh, A./Singh, A.B./Gaur, S.N./Kumar, L./Roy, I./Ravindr, P.. Clinical and immunologic evaluation of <i>Cedrus deodara</i> pollen: a new allergen from India. Allergy. 55: 620-626.	[Causes allergies or is otherwise toxic to humans? Potentially] "Background: Allergy to pollen from gymnosperms is well documented in the West. However, many allergenic species are native to the Himalayan region of India, and <i>Cedrus deodara</i> (Pinaceae) was selected for allergologic investigation. The objective was to define the allergologic and immunochemical aspects of C. deodara pollen." ... "Conclusions: Patients from the Himalayan region, where CD occurs naturally, were sensitized more than patients from distant places. The immunochemical characterization revealed multiple protein fractions from low to very high molecular mass (14 ± 126 kDa) mostly in the acidic pl range. CD pollen has been recognized as a new allergen from India for the first time." ... "Cedrus deodara (CD), also belonging to the family Pinaceae, is a large evergreen tree and occurs as natural forest cover in the outer Himalayas from Kashmir to Garhwal at an altitude of 1300 ± 3500 m above msl. It has been reported to be one of the important components of airborne pollen in the Himalayan region. Its pollen is present in the air from August to December, with maximum concentration during October (16 ± 19). The pollen of CD is even transmitted to the plains of India about 500 km from the source (20)."
407	2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	[Causes allergies or is otherwise toxic to humans? No evidence of toxicity]
407	2012. Pollen Library. Deodar (<i>Cedrus deodara</i>). IMS Health Incorporated, http://www.pollenlibrary.com/Specie/Cedrus+deodara/	[Causes allergies or is otherwise toxic to humans? No] "Allergenicity: No allergy has been reported for Deodar (<i>Cedrus deodara</i>) species."
408	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Creates a fire hazard in natural ecosystems? Yes] "C. deodara trees are damaged by snow and fire."
408	2009. Virginia Cooperative Extension. Virginia Firescapes: Firewise Landscaping for Woodland Homes. Virginia Polytechnic Institute and State University, pubs.ext.vt.edu/430/430-300/430-300_pdf .	[Creates a fire hazard in natural ecosystems? Yes] <i>Cedrus deodara</i> - Flammability Rating = High

408	2010. County of Los Angeles Fire Department. Fire Hazard vs. Erosion Control. http://fire.lacounty.gov/forestry/VegetationManagementMiscTopics.asp	[Creates a fire hazard in natural ecosystems? Yes] "CEDRUS DEODARA (Deodar Cedar):" ... "Should not be used in areas where Brush Fires occur."
409	1996. Bhatnagar, S.P./Moitra, A.. Gymnosperms. New Age International, New Delhi	[Is a shade tolerant plant at some stage of its life cycle? Yes] "A tolerant tree that will grow fairly well in shade, requiring full sun light with age."
410	1996. Bhatnagar, S.P./Moitra, A.. Gymnosperms. New Age International, New Delhi	[Tolerates a wide range of soil conditions? Yes] "It grows on a variety of deep, rich soils, formed from various parent materials. It will grow on thin rocky poor soils, but growth is stunted."
410	1996. Rowell, R.J.. Ornamental Conifers for Australian Gardens. UNSW Press, Sydney	[Tolerates a wide range of soil conditions? Yes] "The Indian Cedar is one of the most adaptable of the conifers, thriving in a broad range of climates and soil types, given the basic essential of good drainage."
410	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Tolerates a wide range of soil conditions? Yes] "Geologically, substrates of C. deodara forests include granite, gneiss, mica and other schists, shale, limestone, quartzite and conglomerate. The soil is loam (predominantly sandy), with high levels of organic carbon, low phosphorus and high potash contents (Raina et al., 1994). It avoids stiff, badly drained soil, and its growth is stunted on rocky shallow soil. The best growth is attained on deep, fairly porous, fertile soil in cool situations."
411	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Climbing or smothering growth habit? No] "A very large evergreen tree, attaining a height to 65 m and more than 4 m stem diameter, ..."
412	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Forms dense thickets? Yes] "C. deodara is typically a gregarious tree, a light demander, and is frequently found in the form of pure crops."
501	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Aquatic? No] "A very large evergreen tree, attaining a height to 65 m and more than 4 m stem diameter, ..." [Terrestrial]
502	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Grass? No] Pinaceae
503	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Nitrogen fixing woody plant? No] Pinaceae
504	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "A very large evergreen tree, attaining a height to 65 m and more than 4 m stem diameter, with horizontal or slightly ascending or descending branches, which are not whorled but arise irregularly from the stem (Troup, 1921)."
601	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Evidence of substantial reproductive failure in native habitat? No] "Where conditions are favourable, the natural tendency of C. deodara is to regenerate in groups or masses of more or less even age in the neighbourhood of seed bearers, either in gaps of sufficient size or in completely isolated situations"
602	1993. Sheikh, M. I.. Trees of Pakistan. Pictorial Printing (Pvt) Ltd., Islamabad	[Produces viable seed? Yes] "It is reproduced from seed. Seed viability is low."
603	2003. Fady, B./Lefèvre, F./Reynaud, M./Vendramin, G.G./Bou Dagher-Kharrat, M./Anzidei, M./Pastorelli, R./Savouré, A./Bariteau, M.. Gene flow among different taxonomic units: evidence from nuclear and cytoplasmic markers in Cedrus plantation forests. TAG T	[Hybridizes naturally? Unknown] "Thus, we clearly demonstrated that hybridization is possible and frequent between C. atlantica and C. libani, and possible between C. atlantica and C. brevifolia. Mediterranean Cedrus taxa should not be considered as biologically isolated species. Because of obvious phenotypic differences at individual, chromosome and molecular levels (e.g. Barthelemy et al. 2000; Bou Dagher Kharrat et al. 2001; Fady et al. 2002, respectively), they should not be grouped into one single species either." [Evidence of hybridization used to argue that separate Cedrus taxa are not isolated species, nor are they single species. Unknown for C. deodara]
604	1996. Bhatnagar, S.P./Moitra, A.. Gymnosperms. New Age International, New Delhi	[Self-compatible or apomictic? Yes] "It is monoecious. The male flowers or cones are solitary on the ends of branches. The female flowers are erect along the tops of the branches, 10 to 15 cm long, and oval to pyramidal in shape."
604	2010. Khanduri, V.P./Sharma, C.M.. Male and female reproductive phenology and annual production of male cones in two natural populations of Cedrus deodara. Nordic Journal of Botany. 28: 119–127.	[Self-compatible or apomictic? Yes] "Flowering shows a high level of asynchrony among individuals within the population, leading to a possibility for geitonogamous within. "... "The reproductive system of C. deodara is exclusively sexual and the mating system is characterized by the levels of inbreeding..."

605	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Requires specialist pollinators? No] "C. deodara is dioecious. Male flowers are pale green to yellowish green with purplish tinge, oblong-ovoid, and 2.5 to 4.6 cm long by 1 to 1.5 cm in diameter. On opening they elongate rapidly to 5-7.5 cm and become yellow with pollen. The female flowers are solitary and erect at the end of arrested branchlets; flowers, at the time of pollination, are oblong-ovoid, 1.2 to 2.0 cm long and 0.6 cm in diameter, pale glaucous green. The scales occur in a spiral of 8 x 5; at the time of pollination they stand perpendicular to the axis, exposing ovules, and close after pollination." [Wind pollinated]
606	1993. Sheikh, M. I.. Trees of Pakistan. Pictorial Printing (Pvt) Ltd., Islamabad	[Reproduction by vegetative fragmentation? No] "It is reproduced from seed. Seed viability is low."
606	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Reproduction by vegetative fragmentation? No] "Seed sowing to grow seedlings is generally done in the nursery in March. The best seed germination rate is obtained in seeds soaked in water for 24 hours (Jin et al., 1996). The type of growing medium also has a significant and varying impact on germination, length and weight of shoots and roots, collar diameter, shoot/root and sturdiness ratios, and quality index. Maximum germination is observed in soil from deodar forest floor (Bana et al., 1996). Treatment of seed with mycorrhizal fungi significantly increases plant biomass (Shah et al., 1998). Seeds stratified at 5°C in moist sand for 30 days also give a much higher percentage germination (44.7%) than those stratified for 15 days (16%) or not at all (11.3%) (Blomme and Degeyter, 1978). This species can be propagated vegetatively with enhanced survival of plantlets by treating greenwood cuttings with auxin, NAA hormone and other plant growth regulators such as aminobenzotriazole (Shamet and Khosla, 1995; Zhang et al., 1998). Rooting of cuttings was significantly improved by treatment with 0.5% IAA-talc or 1% NAA-charcoal, and 0.25% NAA-talc (Shamet and Bhardwaj, 1995). C. deodara rooting was found to be best (67%) with a 5000 p.p.m. IBA dip (Nicholson, 1984). In a study by Sheikh et al. (1984), an increase in height growth was observed with NPK combination, and foliar N content was increased most by the NPK combination."
607	1996. Bhatnagar, S.P./Moitra, A.. Gymnosperms. New Age International, New Delhi	[Minimum generative time (years)? 4+] "The seed in the cone takes a full year to mature after pollination and a full 2 years for the reproductive cycle to be completed." ... "It grows slow. MAI of 6 to 9 m ³ /ha/yr has been recorded." [Slow growth rate and slow time for cones to mature]
701	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? No] "The seed with wing is 2.5 to 3.7 cm long, triangular; wings with rounded corners, 2-2.5 cm wide; seed without wing 2-2.5 cm wide, irregularly triangular." [Unlikely. Seeds relatively large and lack means of external attachment]
702	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules dispersed intentionally by people? Yes] "C. deodara is the most important timber tree of the western Himalayan regions, where it occurs at altitude 1100-3000 m, usually on silicate mother rocks (Vidakovic, 1991). Its wood is highly valuable and extensively used for building, railway sleepers, and other purposes for which durability is required, as well as for furniture, general carpentry, and many other purposes in the plains of India and Pakistan. It is widely planted in Europe as an ornamental tree, and a number of cultivars exhibit variety in needle and shoot colour, as well as in habit (Vidakovic, 1991)." ... "Trials of C. deodara as a Christmas tree in South Carolina, USA, indicate that this species is a possible substitute for pines (Schoenike, 1976)."
703	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules likely to disperse as a produce contaminant? No] "The seed with wing is 2.5 to 3.7 cm long, triangular; wings with rounded corners, 2-2.5 cm wide; seed without wing 2-2.5 cm wide, irregularly triangular." [Unlikely. Seeds relatively large and lack means of external attachment] ... "The seeds are oily and soon lose their viability, but good fresh seed is usually highly viable." [No evidence, and unlikely that relatively large seeds, with short viability, would inadvertently contaminate produce]
704	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules adapted to wind dispersal? Yes] "The ripe cones (solitary, or in pairs) are erect, brown, ovoid or ellipsoidal, 7.5-12 cm long and 5-8.7 cm in diameter with numerous fan shaped scales arranged in spirals of 8 x 5 on persistent woody central axis. On each scale rests a pair of winged seeds. The seed with wing is 2.5 to 3.7 cm long, triangular; wings with rounded corners, 2-2.5 cm wide; seed without wing 2-2.5 cm wide, irregularly triangular."
705	1993. Sheikh, M. I.. Trees of Pakistan. Pictorial Printing (Pvt) Ltd., Islamabad	[Propagules water dispersed? No] "There are two winged seed beneath each cone scale. Seed is shed in November." ... "It grows on steep, cool, northern exposures and in valleys." [Morphology and distribution do not indicate that water is an important or common dispersal vector]

706	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules bird dispersed? No] "The ripe cones (solitary, or in pairs) are erect, brown, ovoid or ellipsoidal, 7.5-12 cm long and 5-8.7 cm in diameter with numerous fan shaped scales arranged in spirals of 8 x 5 on persistent woody central axis. On each scale rests a pair of winged seeds. The seed with wing is 2.5 to 3.7 cm long, triangular; wings with rounded corners, 2-2.5 cm wide; seed without wing 2-2.5 cm wide, irregularly triangular."
707	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules dispersed by other animals (externally)? Unknown] "The ripe cones (solitary, or in pairs) are erect, brown, ovoid or ellipsoidal, 7.5-12 cm long and 5-8.7 cm in diameter with numerous fan shaped scales arranged in spirals of 8 x 5 on persistent woody central axis. On each scale rests a pair of winged seeds. The seed with wing is 2.5 to 3.7 cm long, triangular; wings with rounded corners, 2-2.5 cm wide; seed without wing 2-2.5 cm wide, irregularly triangular." [No means of external attachment, but rodents or other seed predators may cache seeds via external transport]
708	1993. Sheikh, M. I.. Trees of Pakistan. Pictorial Printing (Pvt) Ltd., Islamabad	[Propagules survive passage through the gut? Unlikely] "There are two winged seed beneath each cone scale. Seed is shed in November." [Adapted for wind dispersal. Any consumption likely results in predation]
801	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Prolific seed production (>1000/m ²)? Potentially] "About 8000 seeds weigh a kilogram (Troup, 1921; Parker, 1956). The maximum cone weight (226.5 gm/cone), seed weight/cone (16.86 mg) and seed yield (7.44%) were recorded in the tree diameter class of 41-50 cm by Singh et al. (1997). The seeds are oily and soon lose their viability, but good fresh seed is usually highly viable. The periodicity of good seed years is about one in three (Troup, 1921)."
802	1996. Bhatnagar, S.P./Moitra, A.. Gymnosperms. New Age International, New Delhi	[Evidence that a persistent propagule bank is formed (>1 yr)? No] "The fresh seeds are highly fertile, but lose viability soon."
802	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Evidence that a persistent propagule bank is formed (>1 yr)? No] "The seeds are oily and soon lose their viability, but good fresh seed is usually highly viable."
803	2012. WRA Specialist. Personal Communication.	[Well controlled by herbicides? Unknown] No information on herbicide efficacy or chemical control of this species.
804	1940. Pryor, L. D.. The effect of fire on exotic conifers. Australian Forestry. 5: 37-8.	[Tolerates, or benefits from, mutilation, cultivation, or fire? No] "Two factors that determine the survival of a tree after fire are bark thickness and ability to produce new foliage. Exotic conifers are listed in order of their ability to resist fire." ... "Very susceptible - <i>P. lambertiana</i> , <i>P. strobus</i> , <i>P. monticola</i> , <i>Pseudotsuga douglasii</i> , <i>Cedrus deodara</i> , <i>Sequoia gigantea</i> , <i>Picea alba</i> ."
804	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Tolerates, or benefits from, mutilation, cultivation, or fire? No] "C. deodara trees are damaged by snow and fire."
805	2012. WRA Specialist. Personal Communication.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown\ Unlikely