

Plant Propagation Protocol for *Arceuthobium monticola*

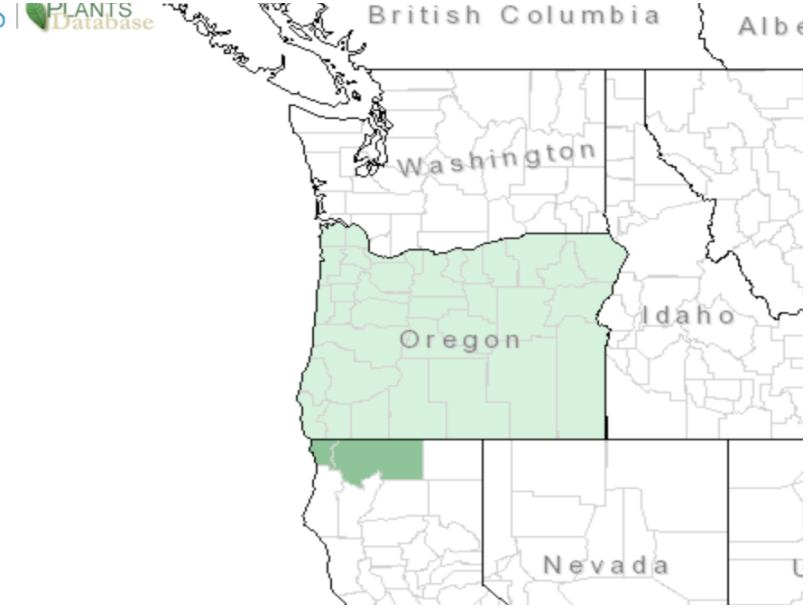
ESRM 412 – Native Plant Production

Protocol URL: <https://courses.washington.edu/esrm412/protocols/ARMO13.pdf>



TAXONOMY

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Plant Family	
Scientific Name	<i>Viscaceae</i>
Common Name	Dwarf Mistletoe
Species Scientific Name	
Scientific Name	<i>Arceuthobium monticola</i> Hawksw., Wiens & Nickrent
Varieties	N/A
Sub-species	N/A
Cultivar	N/A
Common Synonym(s)	N/A
Common Name(s)	Western White Pine Dwarf mistletoe
Species Code (as per USDA Plants database)	ARMO13
GENERAL INFORMATION	

<p>Geographical range (distribution maps for North America and Washington state)</p>	<p>(12)</p> 
<p>Ecological distribution</p>	<p>Found in mountainous forests where <i>Pinus Monticola</i> (host) can be found. Endemic to Klamath Mountains and Siskiyou Mountains of Oregon and California (1)</p>
<p>Climate and elevation range</p>	<p>Found at elevations of 700 to 19000 m (1) It has adapted to a Mediterranean climate with wet and cool summer with dry summers.</p>
<p>Local habitat and abundance</p>	<p>Found on branches or crowns of host conifer trees. Primary host is <i>P. monticola</i> while <i>P. lambertiana</i> is a secondary host. Occasionally/rarely <i>P. breweriana</i> or <i>P. jeffreyi</i>. (1)</p>
<p>Plant strategy type / successional stage</p>	<p><i>A. monticola</i> is a obligate parasite, being completely dependent on its host. It is a seral species due its main host (<i>P. monticola</i>) being a seral species. (3)</p>
<p>Plant characteristics</p>	<p>Obligate parasite with shoots that measure 5-10 cm with tall dark brown flabellately branched. Basal diameter of dominant shoots 2-4 mm. This species is dioicous and begin to flower in July and continue into august. They pollinated by both insect and wind (5). The flowers are staminate and 3 – merous. They mature into fruit that measure 4.0 – 4.5 mm long, 2.0 -2.5 mm wide. (4) The maturing stage requires 13 to 15 months after pollination. Each fruit contains one seed. These seeds are stickily and are explosively discharged from the fruit in early October to early November (5). These seeds can travel 10 -13 m after discharge. In the early stages of <i>A. monticola</i>'s life cycle, it will appear as swelling on the infected site of the host. Shoots will appear from the host branch 2 to 3 years after initial infection. Shoots require 4 years after initial establishment to flower,</p>

	with fruit appear in year 5 (5).
PROPAGATION DETAILS	
Ecotype	Located parasitizing a <i>P. monticola</i> or secondary host in the Klamath Mountains and Siskiyou Mountains. These mountain ranges are located in southwestern Oregon and northwestern California.
Propagation Goal	To collect seeds for further inoculations
Propagation Method	Inoculate a <i>P. monticola</i> branch with <i>A. monticola</i> seeds
Product Type	The product, due to the species parasitic lifestyle, will have to seed. This because if a branch containing a <i>A. monticola</i> is removed it will die, thus the only way to create product for an out planting site is by seed. (6)
Stock Type	Seed
Time to Grow	Upon inoculation, there will be symptoms of swelling for 1 to 2 years (6). After this, shoots will erupt from the host tissue. eventually develop either male or female flowers (around 4-5 years of inoculation). Once pollinated these fruit will take 13 to 15 months for fruit to mature. Once mature the seeds can be collected (2). This is the general life cycle of <i>Arceuthobium sp.</i> Before inoculation however a host (<i>P. monticola</i>) must be either propagated or found in the wild.
Target Specifications	
Propagule Collection Instructions	Seeds are collected from early October through November. The seeds will be cover in a stickly clear substance called viscin. This substance becomes a lubricant when exposed to water and will stick to any surface when it dries. (1, 7). Running strips of Cleese cloth radially from the base of an infected tree can collect the seeds as they are released from the fruits. (10)
Propagule Processing/Propagule Characteristics	Each fruit contains one seed, thus the amount of seed will depend on the amount of fruit per female plant.
Pre-Planting Propagule Treatments	Keep viscin surrounding the seeds, it will allow for the seed to adhere to the bark of the host (5).
Growing Area Preparation / Annual Practices for Perennial Crops	The host plant can be inoculated at any age however plant that are 2 to 3 meters in height and 10 years or older are preferred. (9)
Establishment Phase Details	Seeds will germinate in mid April (10)
Length of Establishment Phase	Once inoculated the seed will grow into the host's branch and causing swelling of the area. This phase of the life cycle will take 2 years (5)
Active Growth Phase	The plant will actively grow until it begins flowering at 4-5 years after inoculation (5).
Length of Active Growth Phase	2-3 years (5)

Hardening Phase	Not found in literature
Length of Hardening Phase	Not found in literature
Harvesting, Storage and Shipping	Harvest seeds by running cheesecloth radial around the base the of the host tree. (10)
Length of Storage	Seed viability will decrease if stored for a extended time. Seeds should be kept in temperature of 5 C (11)
Guidelines for Outplanting / Performance on Typical Sites	10 – 50% of seeds will survive (10). It will take 6 years mature fruit to appear. When introducing <i>A. monticola</i> to a site makes sure there are several host species in the immediate area and are within 20 feet of the host tree. This will assure that the <i>A. monticola</i> population does not disappear from lack of hosts. Select branches that are at low risk of snapping. If the branch snaps, the <i>A. monticola</i> will die.
Other Comments	

INFORMATION SOURCES

References	<ol style="list-style-type: none"> 1. Geils, B. W., J. C. Tovar, and B. Moody. "Mistletoes of North American conifers. USDA Forest Service." <i>Gen. Tech. Rep. RMRS-GTR-98</i> (2002). 2. Skinner, Carl N., Alan H. Taylor, and James K. Agee. "Klamath mountains bioregion." <i>In: NG Sugihara, JW van Wagendonk, J. Fites-Kaufmann, KE Shaffer, and AE Thode, editors. 2006. Fire in California's ecosystems. University of California Press, Berkeley. pp. 170-194</i> (2006): 170-194. 3. "Pinus Monticola." US Forest Service, US Forest Service, www.fs.fed.us/database/feis/plants/tree/pinmot/all.html 4. Hawksworth, Frank G., and Delbert Wiens. <i>Dwarf mistletoes: biology, pathology, and systematics</i>. Diane Publishing, 1998. 5. Mathiasen, Robert L., Pronos, John., Beatty, Jerome S. "Sugar Pine and Western White Pine Dwarf Mistletoes, USDA Forest Service" (2005) 6. "Pine (Pinus Spp.)-Dwarf Mistletoe." Pacific Northwest Pest Management Handbooks, OSU Extension Service - Extension and Experiment Station Communications, 19 Apr. 2018, pnwhandbooks.org/plantdisease/host-disease/pine-pinus-spp-dwarf-mistletoe. 7. Paquet, Peter J., et al. "Characteristics of viscin from the seeds of dwarf mistletoe." <i>Botanical gazette</i> 147.2 (1986): 156-158. 8. Baranyay, J. A., and R. B. Smith. "Low temperature damage to dwarf mistletoe fruit." <i>Canadian Journal of Forest Research</i> 4.3 (1974): 361-365. 9. Government of British Columbia "Dwarf Mistletoe Management Guidebook". Forest Practice Code of British Columbia Act (1995)
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Other Sources Consulted	
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