

Plant Propagation Protocol for *Hemitomes congestum* A. Gray

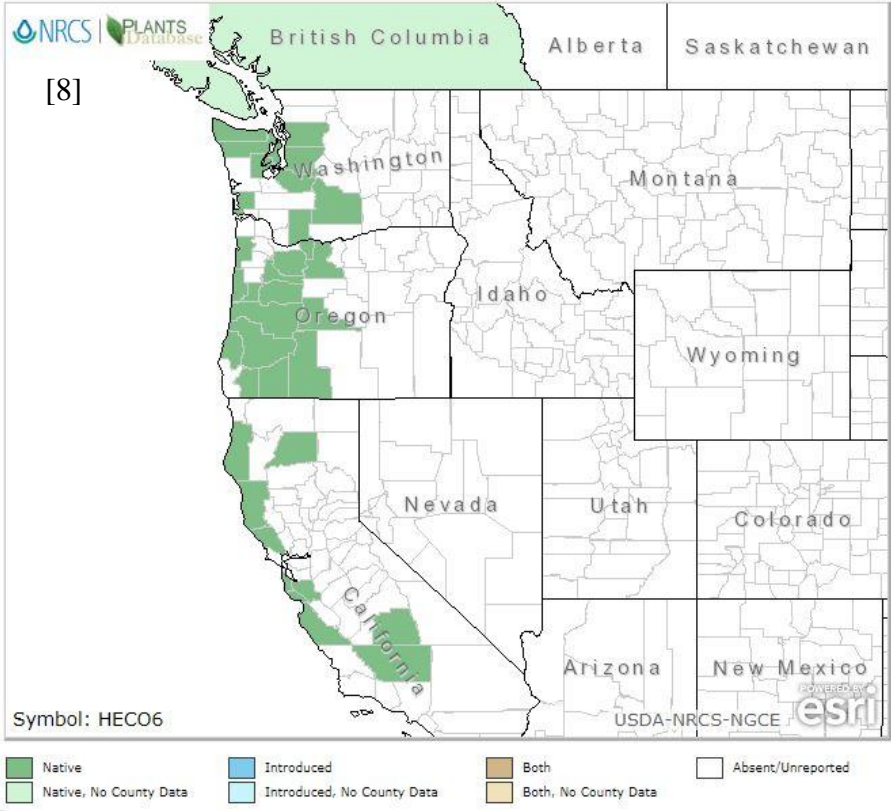
ESRM 412 – Native Plant Production

Protocol URL: <https://courses.washington.edu/esrm412/protocols/HECO6>



TAXONOMY	
Plant Family	
Scientific Name	Ericaceae [1, 2, 3, 4, 5, 6, 7]
Common Name	Heath family or Heather family [1, 2]
Species Scientific Name	
Scientific Name	<i>Hemitomes congestum</i> A. Gray [3, 4, 5, 6, 7, 8]
Varieties	None
Sub-species	None
Cultivar	None
Common Synonym(s)	<i>Newberrya congestum</i> Torr. [3, 4, 6, 7, 8]
Common Name(s)	Gnome-plant, Coneplant [3, 4, 5, 6, 7, 8]
Species Code (as per USDA Plants database)	HECO6 [8]

GENERAL INFORMATION

<p>Geographical range</p>	<p>Occurs sporadically from southern B.C. to Kern County, CA; mostly growing west of the Cascades and the Sierra Nevada [3, 4, 6, 8, 9]</p> <p>[8]</p>  <p>Symbol: HECO6</p> <p>Legend:</p> <ul style="list-style-type: none"> Native Introduced Both Absent/Unreported Native, No County Data Introduced, No County Data Both, No County Data
<p>Ecological distribution</p>	<p>Damp coniferous forests with rich humus in lowland and montane zones [3, 4, 6, 8, 9]</p>
<p>Climate and elevation range</p>	<p>Low to mid elevation areas (20 to 1070 meters, or 65 to 3510 feet) with moist to mesic precipitation regimes. Occurs more in mid-elevation/montane zones than in lowland areas [3, 4, 5, 6, 8, 9]</p>
<p>Local habitat and abundance</p>	<p>Occurs sporadically throughout damp coniferous forests. Less common in the northern and southern parts of its range, as well as the lower end of its elevation range [3, 4, 6, 7, 8, 9]</p> <p>Most commonly found in mixed coniferous forests consisting of <i>Tsuga heterophylla</i>, <i>Pseudotsuga menziesii</i>, and <i>Thuja plicata</i>. Also associated with <i>Polystichum munitum</i>, <i>Gaultheria shallon</i>, and <i>Linnaea borealis</i> [10]</p>

Plant strategy type / successional stage	Mycoparasitic [2-12]
Plant characteristics	<p>A fleshy perennial herb of 3 to 20 centimeters that lacks chlorophyll and forms small clusters of densely packed pinkish flowers. Each flower consists of 4 sepals and 4 petals that closely resemble each other, 8 hairy stamens, and 1 yellowish carpel. Flowers bloom from early to mid summer and give rise to small, fleshy, egg-like berries that have a distinctly musky or cheesy odor. [3, 4, 5, 6, 8, 9]</p> <p>The plant's short stems and scale-like leaves are so reduced that the inflorescence is typically all that is seen. Parasitizes mycorrhizal fungi associated with coniferous trees. [3, 4, 5, 6, 8, 9]</p>
<p style="text-align: center;">PROPAGATION DETAILS</p> <p>*****Note*****</p> <p>An extensive search yielded no propagation information for <i>Hemitomes congestum</i>. Consequently, the following protocol is speculative in nature, informed primarily by the documented life history of <i>H. congestum</i> [2-12], along with a 2005 <i>Molecular Ecology</i> article that explored various aspects of the plant-fungus relationship between members of the Monotropeae and their associated mycorrhizal fungi [13]. Although <i>H. congestum</i> was not specifically addressed in this study, <i>H. congestum</i> is a member of the Monotropeae (a mycoparasitic subfamily nested within the Ericaceae), so many of the researchers' protocols and findings will most likely be at least somewhat applicable. Additional sources concerning the propagation of parasitic plants in general were also consulted [14-16].</p>	
Ecotype	Information not available
Propagation Goal	Plants capable of overwintering and persisting in a natural setting [3, 4, 6, 8, 9]
Propagation Method	Seed [13, 14, 15, 16]
Product Type	Plug [17]
Stock Type	<p>2 gallon pot, planted with <i>Tsuga heterophylla</i>, <i>Pseudotsuga menziesii</i>, or <i>Thuja plicata</i> as "host plant" [10, 13].</p> <p>In reality, <i>H. congestum</i> will derive carbohydrates from a mycorrhizal fungus, not the "host plant," but the mycorrhizal fungus will derive its carbohydrates from the "host plant" [11, 12, 13, 16].</p>
Time to Grow	1 growing season (approximately 6 to 7 months) [5, 7, 13]

Target Specifications	Target plants will have flowered and begun to die back in preparation for overwintering [3, 4, 6, 8, 9].
Propagule Collection Instructions	Look for the pinkish white berries of <i>H. congestum</i> in mid to late summer. Midsummer may yield greater results, as the fruits are the subjects of heavy herbivory. If you plan to store the fruit for longer than a week before processing, consider air drying the fruit to avoid fungal issues [3, 4, 5, 6, 8, 9, 13, 17].
Propagule Processing/Propagule Characteristics	<p>Use a series of sieves to isolate the seeds. Very fine sieves will be required (a 50 micrometer mesh screen is recommended), as the seeds of <i>H. congestum</i> are remarkably small (commonly described as dust-like) [13, 17].</p> <p>No information regarding seed density is available for <i>H. congestum</i>, but it is known that the seeds are so small that they are best described as dust-like [13].</p> <p>No information regarding seed longevity is currently available.</p>
Pre-Planting Propagule Treatments	No information regarding scarification or stratification is currently available for <i>H. congestum</i> . However, it is known that members of the Monotropoideae (of which <i>H. congestum</i> belongs) require a mycorrhizal association in order to germinate. Furthermore, it has been documented that there is a high level of species specificity in terms of the mycorrhizal fungus involved, though the exact fungal species for <i>H. congestum</i> has not yet been determined. Until the exact fungal species associated with <i>H. congestum</i> has been identified and cultivated, one's best bet will be to sow the seeds of <i>H. congestum</i> in a pot with an already established "host plant," which will hopefully form the necessary mycorrhizal associations naturally on its own accord. With this in mind, it would be best to sow the seeds of <i>H. congestum</i> outdoors [13].
Growing Area Preparation / Annual Practices for Perennial Crops	<i>H. congestum</i> seeds should be sown in a container containing an already established <i>Tsuga heterophylla</i> , <i>Pseudotsuga menziesii</i> , or <i>Thuja plicata</i> in order to facilitate the plant's obligate mycorrhizal association. Based on naturally occurring populations of <i>H. congestum</i> , a medium that is rich in humus would likely facilitate the germination and growth of the plant (i.e., utilize compost). Keeping the medium damp to moist should also facilitate the establishment of mycorrhizal fungi and therefore <i>H. congestum</i> as well [3, 4, 6, 8, 9, 13].
Establishment Phase Details	Keep media damp to moist [3, 4, 5, 6, 7, 9].

Length of Establishment Phase	Unknown
Active Growth Phase	Keep media damp to moist [3, 4, 5, 6, 7, 9].
Length of Active Growth Phase	Unknown
Hardening Phase	Expose plants to cooling outdoor temperatures and allow them to die back (a short rhizome and possibly a short stem / crown-like structure will be all that remains). The coniferous “plant host” will remain green [3, 4, 5, 6, 9].
Length of Hardening Phase	Unknown
Harvesting, Storage and Shipping (of seedlings)	Plants may be sold as plugs to be planted in either winter or early spring. A single plug will consist of both the dormant <i>H. congestum</i> individual and its “plant host” [3, 4, 5, 6, 13, 15, 17].
Length of Storage	Unknown
Guidelines for Outplanting / Performance on Typical Sites	Plugs should be planted in winter or early spring (with “plant host” still attached). After establishment, plants will flower from early to mid summer [3, 4, 5, 6, 9, 17].
Other Comments	<p>Conservation Status of <i>Hemitomes congestum</i>:</p> <p>Global Rank: G4 (Apparently Secure) [9]</p> <p>WA State Rank: SNR (Species Not Ranked) [9]</p> <p>B.C. Rank: Yellow Listed (apparently secure and not at risk of extinction) [9]</p>

INFORMATION SOURCES

References	<p>[1] Judd, W. S. (2007). <i>Plant systematics: A phylogenetic approach</i> (3rd ed.). Sunderland, MA: Sinauer Assoc.</p> <p>[2] Rose, J. P., & Freudenstein, J. V. (2014). Cryptic and Overlooked: Species Delimitation in the Mycoheterotrophic <i>Monotropis</i> (Ericaceae: Monotropoideae). <i>Systematic Botany</i>, 39(2), 578-593. doi:10.1600/036364414x680762</p> <p>[3] Giblin, D.E. & B.S. Legler (eds.). 2003+. <i>Hemitomes congestum</i>. In: WTU Image Collection Web Site: Vascular Plants, MacroFungi, & Lichenized Fungi of Washington State. University of Washington Herbarium. http://biology.burke.washington.edu/herbarium/imagecollection.php</p>
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	<p>[15] Ian Caton. 2018. Parasitic Plants for Gardens and Landscapes. <i>Ecological Landscape Alliance</i>. Available at: https://www.ecolandscaping.org/12/native-plants/parasitic-plants-gardens-landscapes/</p> <p>[16] Nickrent, Daniel L. 2002. Parasitic Plants of the World. Chapter 2, pp. 7-27 In J. A. López-Sáez, P. Catalán and L. Sáez [eds.], <i>Parasitic Plants of the Iberian Peninsula and Balearic Islands</i>. Mundi-Prensa Libros, S. A., Madrid.</p> <p>[17] Dumroese, R. K., & Landis, T. D. (2009). <i>Nursery manual for native plants: A guide for tribal nurseries</i>. Washington, D.C.: U.S. Dept. of Agriculture, Forest Service.</p>
Other Sources Consulted	<p>[18] Native Plant Network Propagation Protocol Database: https://npn.rngr.net/propagation</p> <p>[19] Pojar, J., MacKinnon, A., & Alaback, P. B. (2016). <i>Plants of the Pacific Northwest coast: Washington, Oregon, British Columbia & Alaska</i>. Auburn, WA, USA: Lone Pine.</p> <p>[20] Rose, R., Chachulski, C. E., & Haase, D. L. (1998). <i>Propagation of Pacific Northwest native plants</i>. Corvallis: Oregon State University Press.</p>
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