

Plant Propagation Protocol for *Helianthus cusickii*

ESRM 412 – Native Plant Production

URL: <https://courses.washington.edu/esrm412/protocols/2023/HECU2.pdf>



Source: Burke Herbarium

TAXONOMY	
Plant Family	
Scientific Name	Asteraceae
Common Name	Aster family
Species Scientific Name	
Scientific Name	<i>Helianthus cusickii</i>
Varieties	Not listed in USDA
Sub-species	Not listed in USDA
Cultivar	Not listed in USDA
Common Synonym(s)	Not listed in USDA
Common Name(s)	Cusick's sunflower turnip-root sunflower parsnip-root sunflower
Species Code (as per USDA Plants database)	HECU2
GENERAL INFORMATION	

Geographical range



(USDA)



(Turner Photo graphics)

Ecological distribution	Native to the western United States from Washington, Oregon, Idaho, northern California, and northwestern Nevada. Growing in mountain forests and foothills. Dry slopes and open woods (Schilling 2).
Climate and elevation range	Climate: Annual Precipitation: 7.1" - 41.8" Summer Precipitation: 0.36" - 2.55" Coldest Month: 30.0" - 48.7" Hottest Month: 56.9" - 73.2" Humidity: 1.10" - 20.38" (Calscape 2). Elevation: 600-2000m (Schilling 2).
Local habitat and abundance	Helianthus cusickii thrive at dry grassy slopes, open woodland, mountain forests and foothills (Pfaff 1).
Plant strategy type / successional stage	Drought tolerant oilseed (Tassel 124).
Plant characteristics	Perennials, 60–120 cm (taproots stout, parsniplike), a diploid perennial (2n=34). Stems erect to prostrate, glabrous or glabrate (efloras 1). Narrow leaves rising in a clump. Yellow ray flowers and a yellow central disk. Flowering late spring to fall.

PROPAGATION DETAILS (The reference cited from Inoka and Trigiano are not for H. cusickii specifically)	
Ecotype	Seeds were purchased from Onesh Agri (Pvt) Ltd. Kent Road, Colombo (Inoka 2). Seeds were collected from dead and dried stands on an abandoned farmland (Agboola 2).
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Plug + (container-field grown hybrids)
Stock Type	3-to-4-inch peat pot (Agri 5)
Time to Grow	3 weeks with 10 cm height were used to take explants (Inoka 2).
Target Specifications	120 cm tall
Propagule Collection Instructions	Harvesting seeds from mature flower heads of Helianthus cusickii enables the gathering of the plant's propagules. From late summer to early fall (August to September), when the flower heads start to turn brown and dry up, the seeds of Helianthus cusickii are ripe and ready for harvest. The adult flower heads should be cut off and properly dried in a well-ventilated place before collecting seeds. The seeds can be extracted from the dried flower heads by threshing them or gently rubbing them with your fingers (USFS).

Propagule Processing/Propagule Characteristics	Each replicate's 200 achene samples were weighed to estimate the total seed weight, and the number of harvested heads and the total seed weight were used to calculate the number of seeds per head (Gimeno 3).
Pre-Planting Propagule Treatments	<p>Seeds were washed with soap water and running water for 1/2 to 1 hr. Then the surface sterilized by immersion in 70% ethanol for two minutes. After that using 20% clorex for 20 minutes in laminar air flow cabinet. Surface sterilized seeds were rinsed 3 times with sterile distilled water and dried onto sterile filter papers. The seed coat was removed using sterile scalpels and pliers (Inoka 2).</p> <p>Seeds were sun-dried to constant weight and kept in a desiccator at room temperature until the commencement of the experiment (Akinola 2).</p>
Growing Area Preparation / Annual Practices for Perennial Crops	<p>Glass tubes with MS (Inoka 2).</p> <p>The soil has a deep alluvial, sandy loam texture, and a moderately good water-storage capacity. It is a Typic Xerofluvent (Gimeno 2).</p>
Establishment Phase Details	Seeds were introduced to glass tubes (1 seed/tube) containing 5ml of hormone free Murashige and Skoog's basal medium (MS). After 14 days, stems were dissected from in vitro grown seedling as explant (Inoka 2).
Length of Establishment Phase	1 to 2 weeks (Rspb 2).
Active Growth Phase	<p>Place the sunflower in the soil that receives plenty of sunlight. Keep the soil uniformly moist until you notice new growth, which indicates that the sunflower plant has established itself. After that, water the plant once a week or whenever the soil begins to feel dry to the touch (Agri 6).</p> <p>Feed the plant with all-purpose fertilizer twice, once in mid-June and again in August (Agri 3).</p>
Length of Active Growth Phase	18 to 78 days after pre-tuberization.
Hardening Phase	N/A
Length of Hardening Phase	N/A
Harvesting, Storage and Shipping	<p>Seeds were separated from somatic tissues, stored in glass vials at room temperature (Trigiano 3).</p> <p>The cleaned seed is then prepared for long-term storage at 4C and 35% humidity (Seiler 5).</p>
Length of Storage	N/A
Guidelines for Outplanting /	According to Inoka's experiment, explanting stems have higher response for the shoot regeneration than leaf and root (4).

Performance on Typical Sites	
Other Comments	In comparison to the planting on January 1, there is a considerable drop in the amount of early cultivar seeds. For all planting dates, the early genotype had heavier seeds while the late cultivar had more seeds per head (Gimeno 5).
INFORMATION SOURCES	
References	<ol style="list-style-type: none"> 1. "Taxon: Helianthus Cusickii A. Gray." <i>Helianthus Cusickii</i> A. Gray <i>GRIN-Global</i>, npgsweb.ars-grin.gov/gringlobal/taxon/taxonomydetail?id=104287. Accessed 3 May 2023. 2. Turner, Mark. "Helianthus Cusickii: Cusick's Sunflower: Wildflowers of the Pacific Northwest." <i>Turner Photographics</i>, http://www.pnwflowers.com/flower/helianthus-cusickii. 3. "Growing Sunflowers Step-by-Step: Plant A Sunflower." <i>The RSPB</i>, https://www.rspb.org.uk/fun-and-learning/for-families/family-wild-challenge/activities/flower-power/. 4. Inoka, K., and Nilanthi Dahanayake. "Effect of plant growth regulators on micro-propagation of sunflower (<i>Helianthus annuus</i> L.)." <i>International Journal of Scientific and Research Publications</i> 5.1 (2015): 1-5. 5. Trigiano, R. N., S. B. Wilson, and C. N. Steppe. "Whorled sunflower (<i>Helianthus verticillatus</i>): a potential landscape plant." <i>Combined Proceedings International Plant Propagators Society</i>. URL: http://www.ipps.org/proceedings-volume/whorled-sunflower-helianthusverticillatusa-potential-landscape-plant/110 (accessed 20 Dec 2020) (2018). 6. Agboola, D. A., et al. "Seed Germination and Seedling Growth of the Mexican Sunflower <i>Tithonia Diversifolia</i> (Compositae) in Nigeria, Africa." <i>Revista de Biología Tropical</i>, vol. 54, no. 2, 2006, pp. 395–402, https://doi.org/10.15517/rbt.v54i2.13881. 7. Akinola, J. O., et al. "Seed Treatment Methods and Duration Effects on Germination of Wild Sunflower." <i>Experimental Agriculture</i>, vol. 36, no. 1, 2000, pp. 63–69., doi:10.1017/S0014479700361075. 8. Seiler, Gerald J., and Tom J. Gulya. "Exploration for wild <i>Helianthus</i> species in North America: Challenges and opportunities in the search for global treasures." <i>International Sunflower Conference Proceedings</i>. Vol. 1. 2004. 9. Gimeno, V., et al. "Winter Planting as a Means of Drought Escape in Sunflower." <i>Field Crops Research</i>, vol. 22, no. 4, 1989, pp. 307–16, https://doi.org/10.1016/0378-4290(89)90030-0.

	<p>10. Bizzarri, Marco. "Helianthus tuberosus genetic resources: from the plant phenotype to the gene expression analyses during tuber development for studying carbohydrate biosynthesis, tuber biomass productivity, and ancestors of the species." (2013).</p>
Other Sources Consulted	<ol style="list-style-type: none"> 1. WTU Herbarium, Burke Museum. <i>Helianthus Cusickii</i> - <i>Burke Herbarium Image Collection</i>, https://www.burkeherbarium.org/imagecollection/taxon.php 2. USDA Plants Database, https://plants.usda.gov/home/plantProfile?symbol=HECU2. 3. Gray, A., and Edward E. Schilling. "Helianthus Cusickii." <i>Helianthus Cusickii</i> - FNA, http://floranorthamerica.org/Helianthus_cusickii. 4. "Cusick's Sunflower, Helianthus Cusickii." <i>California Native Plant Society</i>, https://calscape.org/Helianthus-cusickii-(Cusick's-Sunflower)?srchr=sc57081ee8ea530. 5. David L Van Tassel - Food and Agriculture Organization. https://www.fao.org/fileadmin/templates/agphome/scpi/Perennial 6. abstracts/Evaluating_perennial_candidates_for_domestication_lessons_from_wild_sunflower_relatives.pdf. 7. <i>Helianthus Cusickii</i> in <i>Flora of North America</i> @ <i>Efloras.org</i>, http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=250066876.
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