

Plant Diversity Website

***Humulus lupulus* L.**

Common Names: Common hops, Hops, New Mexican Hop (8)

Etymology: *Humulus* is a Latin name of uncertain origin, it may have come from the Low German word "humela" for hop; *lupulus* literally means a "small wolf." This is in reference to the plant's habit of climbing over and smothering trees. *H. lupulus* was once called "willow-wolf" due to "its propensity for climbing on willows" (7).

Botanical synonyms: *H. americanus* Nutt., *H. lupulus* var. *neomexicanus* Nels. & Cockerell and *H. neomexicanus* (Nels. & Cockerell) Rydb.

FAMILY: Cannabaceae, the hemp family

Quick Notable Features:

- pistillate flowers in large aments
- the species is dioecious: male and female on separate plants
- covered in yellow glands, mostly on fruit, which secrete lupulin



Plant Height: up to 10m long (3).

Subspecies/varieties recognized (11): *Humulus lupulus* var. *lupuloides*, *Humulus lupulus* var. *lupulus*, *Humulus lupulus* var. *neomexicanus* and *Humulus lupulus* var. *pubescens*

Most Likely Confused with: *Humulus japonicus* and *Rubus* spp.

Habitat Preference: "Species is distributed in fertile, open and waste ground, fencerows; shaded thickets and wooded slopes on bluffs or at bluff bases, along railroads, floodplains; weedy semi-shade" (8).

Geographic Distribution in Michigan: Found in most of the counties of the Upper Peninsula, and the northwest shore of the Lower Peninsula. In southwest Michigan it is found in Muskegon, Kent, Barry, Kalamazoo, Van Buren, and Berrien counties and in Saginaw, Gratiot, Ingham, Oakland, Macomb, Washtenaw and Monroe counties in eastern Michigan. (11)



Known Elevational Distribution: From sea level in many area and up to 2,430m in Utah (9).

Complete Geographic Distribution: Native to Europe and western Asia, in the U.S. *Humulus lupulus* is found in every state except Louisiana, Mississippi, and Florida (11).

Vegetative Plant Description: The plant is a rhizomatous perennial vine (unlike the closely related *Humulus japonicus*, which is an annual vine). Observation of photos shows that this plant does develop a brown stem, most probably wood, while *H. japonicus* only produces a green, herbaceous stem. The leaves are opposite “mostly 3-5(-7) lobed or those of branches sometimes unclift, cordate, rounded to ovate, acuminate or with acuminate lobes, the sinuses between the upper lobes mostly rounded and open.” The vine has a rough stem, that is almost “prickly downward” (2, 3, 5).

Climbing Mechanism: Strongly twining with apex of plant stem (5). According to Darwin, after initially growing straight, the vine begins “moving, like the hands of a watch, with the sun.” We use the term dextral to describe this (or left to right twining). Upon closer observation, Darwin also noticed that the stems made a revolution every two hours, eight minutes during hot weather during daytime (12).

Flower Description: The species is dioecious. The staminate flowers, in “loose axillary panicles, with 5 sepals and 5 erect stamens” on short filaments, are mostly 5-12cm long; the flowers lack petals. The dull green pistillate flowers are in pairs in short axillary and solitary spikes or aments, which are “loose, subglobose or ovoid.” The blunt, short-pointed, membranous bracts are roundish and completely cover the achenes. The style is prolonged into 2 filiform stigmas (2, 3, 5).

Flowering Time: July and August throughout the Northern Hemisphere (8).

Pollinator: The presence of pistillate catkins and apetalous reduced flowers suggests wind pollination (8).

Fruit Type and Description: The fruit is an achene enclosed by a persistent calyx and bracts. The inflorescence is straw-colored and 3-6cm long. The fruit is covered in yellow glands, which secrete lupulin, a bitter substance that makes the plant useful. These glands are found throughout the plant, but are most numerous on the fruit. The photo on the right is of a dissected “hop” and shows the yellow glands (3).

Seed Description: Because the fruit is an achene (a single-seeded fruit that does not open), the seed is dispersed with the achene. No reports give features of seeds of this species, but we include an image of the species from seeds commercially sold for cultivation.

Dispersal Syndrome: The small, light achenes suggest dispersal by mechanical means (i.e. – strong wind or water currents).



Distinguished by: The species is often found in keys close to the related *Humulus japonicus*, but they differ in that *H. japonicus* has 5-7 lobed leaves and stiff hairs on its main veins, while *H. lupulus* leaves are 3(5) lobed with only soft hairs on the undersurface. The petiole of *H. lupulus* is shorter than the leaf blade, while *H. japonicus* has a petiole as long or longer than the leaf blade. It may also be confused with *Rubus spp.* due to their similar leaves, but *Humulus* leaves are opposite, while the species of *Rubus* bear leaves that are alternate.

Other members of the family in Michigan & number species: *Humulus* - 2, *Cannabis* – 2 (9)

Ethnobotanical Uses: The bitter substance produced by the hairs of the cone-like inflorescence is used by brewers to give aroma and flavor to beer. Originally, it was used as a preservative because it prevents gram-negative bacteria from growing in beer or 'wort'. It was later found that these "hops" were what gave beer its flavor. The oils can be used to make perfumes, lotions, face creams, beverages and can be added to tobacco and smoked (1).

Phylogenetic Information: Judd, et al. (4) explain the following about the Urticales, which include the Cannabaceae:

Ulmaceae, Celtidaceae, Cannabaceae, Urticaceae, Moraceae and Cecropiaceae probably constitute a clade, which is diagnosed by globose to elongate cystoliths (concretions of calcium carbonate) within specialized cells (lithocysts), reduced, inconspicuous flowers with five or fewer stamens, and two-carpellate, unilocular ovaries, with a single, apical (to basal) ovule.

They go on to explain that they are "closely related to Rosaceae and Rhamnaceae, and therefore are placed within Rosales (as the suborder Urticineae). However, phylogenetic placement of *Cannabis* and *Humulus* is not certain because, as stated before, they possess laticifers, which would place them with the Urticales, but "*rbcL* sequences places them with Celtidaceae."

Interesting Quotation or Other Interesting Factoid:

---Romans used to eat the young shoots like asparagus; "chopped very fine with butter or cream."

--Most parts, including the rhizome are edible (1).

--The species also has plenty of uses in Chinese and other folk remedies (more information in reference 1), however it may cause dermatitis or hayfever (8).

Literature and websites used:

- 1) Duke, J. A. 1983 *Handbook of Energy Crops*. Unpublished but archived at website for Purdue University Center for New Crops & Plants Products.
http://www.hort.purdue.edu/newcrop/duke_energy/Humulus_lupulus.html
- 2) Fernald, M.L. 1950 *Gray's Manual of Botany*, Fourth Edition. New York: American Book Company, p. 556.
- 3) Gleason, H. A. 1963 *Illustrated Flora of the Northeastern United States and Adjacent Canada*. New York and London: Hafner Publishing Company, Inc.
- 4) Judd, W. S., C. S. Campbell, E. A. Kellogg and P. F. Stevens 1999 *Plant Systematics: A Phylogenetic Approach*. Sunderland, Massachusetts: Sinauer Associates, Inc.



- 5) Hitchcock, C. L. and A. Cronquist 1976. *Flora of the Pacific Northwest*. Seattle and London: University of Washington Press.
- 6) Gleason, H. A. and A. Cronquist 1991 *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*, Second Edition. Bronx, New York: The New York Botanical Garden.
- 7) Charters, M. L. 2006. Latin and Greek meanings and Derivations. In *calflora – California Plant Names*. http://www.etymologie.info/~e/u/_us-__ca__.html
- 8) Iverson, L.R., D. Ketzner, and J. Karnes. 1999. Illinois Plant Information Network. Database at <http://www.fs.fed.us/ne/delaware/ilpin/ilpin.html> Illinois Natural History Survey and USDA Forest Service.
- 9) Ramsey, D. R. Digital Atlas of the Vascular Plants of Utah: Echinocystis Lobata Utah State University Department of Geography and Earth Resources. <http://www.gis.usu.edu/Geography-Department/utgeog/utvatlas/family/cucu/eclo.html>
- 10) Small, E. Cannabaceae Endlicher, Hemp Family. *Flora of North America*. <http://www.efloras.org>
- 11) PLANTS Profile for *Humulus lupulus* (Common Hop) <http://plants.usda.gov/java/profile?symbol=HULU>
- 12) Darwin, C. 1876. *The movements and habits of climbing plants*. New York: D. Appleton and Company.

Image Credits (all used with permission):

- 1) The image of plant habit is courtesy Richard Old, www.xidservices.com.
- 2,3) The images of the leaves and fruit are copyright Louis-M. Landry.
- 4, 5) The image of the achene and seedling are copyright Robyn J. Burnham, University of Michigan

PRIMARY AUTHOR: Marko Melymuka with editing and additions by Robyn J. Burnham

© Robyn J. Burnham, University of Michigan

For additional information on Michigan Plant Diversity web pages please contact Robyn J. Burnham via email: rburnham@umich.edu