

Plant Diversity Website

Cuscuta polygonorum Engelmann

Common Names: Dodder, knotweed dodder, smartweed dodder (2,5).

Etymology: With Arabic origins, *Kushkut*, means dodder plant or parasitic plant; in New Latin, *Cuscuta* directly translates as dodder. The species name, *polygonorum*, refers to the species preference for parasitizing species in the genus *Polygonum* (3,7,16).

Botanical synonyms:

Cuscuta chlorocarpa Engelmann (1).

FAMILY: Convolvulaceae, the morning glory family

Quick Notable Features (3,4):

- Slender orange stems, parasitic
- Compact cymose inflorescences, up to 1cm broad
- Nearly sessile 4-merous flowers bearing 2 styles shorter than the ovary
- Infrastaminal scales with very few teeth, often only 2

Plant Height: The height of *Cuscuta polygonorum* depends on the host; H.L. Dean measured the length of a single dodder plant at nearly half a mile (9).

Subspecies/varieties recognized: none found.

Most Likely Confused with: Other species of *Cuscuta* in Michigan: *C. indecora*, *C. cephalanthi*, *C. coryli*, *C. glomerata*, *C. gronovii*, and *C. pentagona* (2).

Habitat Preference: The species grows mostly on *Polygonum* ssp., but it is also known to grow on *Cephalanthus*, *Lycopus*, *Penthorum*, *Justicia*, Asteraceae family members, and other herbs. *C. polygonorum* prefers low ground in forest thickets, mesic prairies, and wetlands (2,3,6).

Geographic Distribution in Michigan: *C. polygonorum* is recorded from Kalamazoo, Oakland, and Monroe counties (2).

Known Elevational Distribution: The species was collected at 264m elevation in Holt, MO (1).

Complete Geographic Distribution: Native to North America, the species is found in central and eastern United States: AR, CT, DC, DE, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, ND, NE, NJ, NY, OH, OK, PA, RI, TN, TX, VA, and WI; and Canada: ON and QC (1,5).

Parasitism: Plant parasitism is a type of symbiotic relationship in which one plant obtains



nutrients directly from a host plant. This has a detrimental effect on the host, but benefits the parasite. Although parasitic plants are commonly known to lack chlorophyll, some species have green tissue, making them partially photoautotrophic. The physical link between the parasite and the host is called a “haustorium,” and often occurs through xylem-to-xylem attachment. The host can vary, ranging from the mycorrhizae of trees, to grasses and hardwood trees. The parasite often maintains open or partially open stomata, allowing transpiration to aid in extracting nutrients from the host (14).

Vegetative Plant Description: As *Cuscuta* species germinate, they develop a short anchorage root, while a stem forms and nutates (rotates) in search of a host. When an attachment with a host has been created, the anchorage root dies (15). Additional means of finding a host have been suggested in literature, such as positive photoautotrophy or growth toward a source of moisture or specific chemicals (10). The stems of *C. polygonorum* are slender, filiform, and yellow-orange; they coil around the host plant in a dextral orientation. Leaves are absent, instead there are very small, alternate scales (3,4,8).

Flower Description: The inflorescences are compact cyme heads (glomerules) 0.5-1cm broad bearing nearly sessile, white flowers (2-2.5mm long). The fused calyx is 4-parted (rarely 5) oblong to ovate, and apically acute; both calyx and corolla lobes are at least as long as the corolla tube. The corolla is 4-lobed (rarely 5); the erect lobes are narrower than the sepals, apically acute, and persistent at the base of the fruit. The infrastaminal scales are oblong, with very few teeth, often only two. Four stamens are subtended by the scales and included, adnate to the sinuses of the corolla lobes. The superior ovary is depressed-globose and 2-locular, the two distinct styles (<1mm long) are shorter than the ovary, and the stigmas are capitate (2,3,4,6).

Flowering Time: July-September (3,4).

Pollinator: Yuncker observed visits by wasps and other species of the order Hymenoptera to members of the genus *Cuscuta* (11).

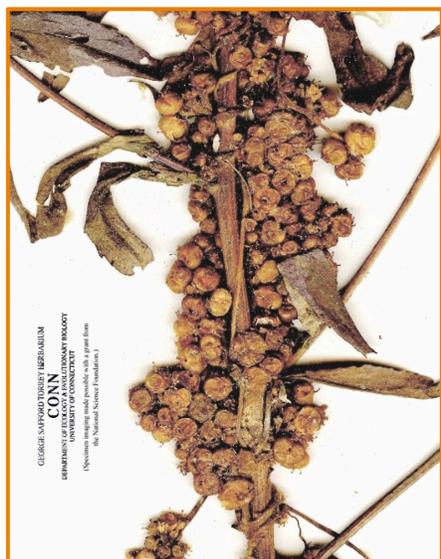


Fruit Type and Description: The fruit is an indehiscent globose capsule, with the remains of the corolla at the base, and the styles at the apex. Each capsule bears up to 4 seeds (3,4).

Seed Description: In the genus *Cuscuta*, the defining characteristic of the mature embryo is the absence of cotyledons. This may derive from the fact that the first job of the young stem is to search for a host, not to photosynthesize. Each ovary bears four ovules, but one or more may abort, which causes variation in seed size and shape; a dodder seed may have zero, one, or two flat surfaces. *C. polygonorum* seeds are about 1.3mm long and yellowish-brown (3,10).

Dispersal Syndrome: In unspecified members of the genus *Cuscuta* both germination in the capsule and seeds falling to the ground were observed, leaving water dispersal or other means a possibility for dispersal. Additionally, *Cuscuta* spp. seeds may be able to pass through the intestinal tract of a sheep intact, remaining viable. Although this method of dispersal is unlikely, it extends the potential dispersal mechanisms to include zoochory (10).

Distinguished by: *C. epithymum* stems are red, not orange-yellow like in *C. polygonorum*. It bears 5-merous pink to red flowers with slender stigmas, not white to yellowish with capitate stigmas as in *C. polygonorum*, and the fruit is circumscissile, while *C. polygonorum*'s is indehiscent. *C. glomerata*'s flowers are 5-merous, enclosed by bracts and its sepals are free, while *C. polygonorum* have bractless flowers with gamosepalous sepals. *C. cephalanthi* has calyx lobes that are shorter than the corolla tube, the corolla lobes are apically round, and the corolla is persistent at the apex of the capsule. *C. polygonorum*'s calyx lobes are at least as long as the corolla tube, the corolla lobes are acute, and the corolla is persistent at the base of the capsule. Additionally, the styles in *C. cephalanthi* are equal or longer than the capsule in length, while in *C. polygonorum*, they are shorter. *C. coryli*'s corolla lobes are incurved and papillose, the styles are longer (over 1mm long), and the corolla is persistent at the apex of the capsule. *C. polygonorum*'s corolla lobes are erect and glabrous, the style shorter than 1mm long. *C. gronovii*, *C. indecora*, and *C. pentagona* are 5-merous. *C. gronovii* and *C. indecora*'s ovary and capsule have a thickened stylopodium, not thickened in *C. polygonorum*. *C. gronovii* has round corolla lobe apices. *C. indecora* has papillose corolla lobes, the calyx is shorter than the corolla tube, and the flowers are larger (2.5-4mm long) than the flowers of *C. polygonorum*. *C. pentagona* stamens are exserted, while *C. polygonorum*'s are included (2,3).



Other members of the family in Michigan (number species): *Calystegia* (5), *Convolvulus* (1), *Cuscuta* (8), and *Ipomoea* (4) (source 2).

Ethnobotanical Uses: The following information is for unspecified members of *Cuscuta*: “An Indian proverb states that the person finding the root of dodder will have access to all the riches of the earth” (10). This statement pertains to the wide use of *Cuscuta* spp. for medicinal purposes across Asia, from herbal mixtures to treat ovarian cancer and postmenopausal osteoporosis to antifungal and insecticidal applications (13). From another perspective, “The dodder’s rapid development and its stranglehold on and damage to the host have earned it a place in the superstition of many Western countries. The German “Teufelsxwirm” and Dutch “Duivelsnaaigaren” are vernacular names of this sort,” highlights *Cuscuta*’s standing as a noxious weed in many places (10).

Phylogenetic Information: Convolvulaceae joins four other families in the order Solanales (Montiniaceae, Sphenocleaceae, Hydroleaceae, and Solanaceae), which encompasses 165 genera and 4,080 species. The distribution of Convolvulaceae is extensive worldwide, excluding areas of extreme temperatures—the Sahara and Gobi Deserts, and areas of high latitude (Canada, Greenland, Russia, Antarctica, as well as the southern tip of South America). Convolvulaceae has been noted as the only Asterid I family whose seeds exhibit physical dormancy (10). *Cuscuta* spp., belonging to the subfamily Cuscutoideae, is the only genus within the family that is parasitic. Its placement in Convolvulaceae is openly debated, but is supported by similar flower morphology (10,11,12) as well as the twining habit.

Interesting Quotation or Other Interesting Factoid not inserted above: Some sources place the genus *Cuscuta* in its own family, Cuscutaceae (4,5). As other members of the genus *Cuscuta*, this species is considered a noxious weed in the United States; it is endangered in Maryland and New York (5).

Literature and websites used:

1. Tropicos.org. Missouri Botanical Garden. 04 Dec 2012
<<http://www.tropicos.org/Name/8500700>>
2. *Michigan Flora Online*. A.A. Reznicek, E.G. Voss, & B.S. Walters February 2011. University of Michigan. Web. December 4, 2012. <http://michiganflora.net/species.aspx?id=858>.
3. Fernald, M. L. 1950. *Gray's Manual of Botany*, 8th ed. New York: American Book Company.
4. Britton, N.L. & H.A. Brown 1970. *An Illustrated Flora of the Northern United States and Canada: Volume III*. New York, NY: Dover Publications, Inc.
5. USDA, NRCS. 2012. The PLANTS Database (<http://plants.usda.gov/java/profile?symbol=CUPO>, 12/04/12). National Plant Data Team, Greensboro, NC 27401-4901 USA.
6. Iverson, L., D. Ketzner, & J. Karnes 2009. Species Information for *Cuscuta polygonorum*, smartweed dodder. Illinois Plant Information Network. USDA Forest Service. <http://nrs.fs.fed.us/data/il/ilpin/spp/?spp=947>
7. Stearn, W.T. 1972. *Stearn's Dictionary of Plant Names for Gardeners*. New York, NY: Sterling Publishing Co. Inc.
8. Marquardt, E.S. 2009. Foraging and host use of the parasitic plant *Cuscuta indecora*. Doctoral Thesis/Dissertation: University of Houston. <http://udini.proquest.com/view/foraging-and-host-use-of-the-pqid:1860341511/>
9. Dean, H.L. 1942. Total length of stem developed from a single seedling of *Cuscuta*. *Proc. Iowa Acad. Sci.* 49: 127–128.
10. Kuijt, J. 1969. *The Biology of Parasitic Flowering Plants*. Los Angeles, CA, USA: University of California Press.
11. Yuncker, T.G. 1920. Revision of the North American and West Indian Species of *Cuscuta*. *Illinois Botanical Monographs*. 6(2&3):1-141.
12. Olmstead, R.G. & S. Stefanović 2004. Testing the phylogenetic position of a parasitic plant (*Cuscuta*, Convolvulaceae, Asteridae): Bayesian inference and the parametric bootstrap on data drawn from three genomes. *Systematic Biology* 53(3): 384-399.
13. Costea, M. & T.J. François 2005. The biology of Canadian weeds. 133. *Cuscuta campestris* Yuncker, *C. gronovii* Willd. ex Schult., *C. umbrosa* Beyr. ex Hook., *C. epithymum* (L.) L. and *C. epilinum* Weihe. *Canadian Journal of Plant Science*. 298.
14. Clark, W.D., R. Moore, & K.R. Stern 1995. *Botany*. Dubuque, Iowa: Wm. C. Brown Publishers.
15. Menninger, E.A. 1970. *Flowering Vines of the World*. New York, New York: Hearthsides Press Incorporated.
16. Brown, R.W. 1956. *Composition of Scientific Words*. Washington, D.C.: Smithsonian Institution Press.

Image Credits (all used with permission):

1. Image of plant with inflorescence courtesy of George H. Bruso, Lady Bird Johnson Wildflower Center
2. Image of colonization by *C. polygonorum* courtesy of Diana Lindenmeyer
3. Image of immature flowers courtesy of John Hilty from Illinois Wildflowers
4. Image of fruiting herbarium specimen courtesy of CONN Herbarium. Copyright © 2012 The George Safford Torrey Herbarium (CONN).

PRIMARY AUTHOR: Cristine V. Santanna & Lauren Sopher, revisions and editing by Robyn J. Burnham.

© Robyn J. Burnham

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