

Plant Diversity Website

***Cuscuta cephalanthi* Engelm.**

Common Names: Buttonbush dodder, butterbush dodder (4,23).

Etymology: With Arabic origins, *Kushkut*, means dodder plant or parasitic plant; in New Latin, *Cuscuta* directly translates as dodder. In Greek, *cephalo* converts to head and *cephalus* to mullet, a type of fish. *Anthos* directly translates to flower in Greek, yet *anthus* translates to wagtail, the bird, in Latin. The genus *Cephalanthus* is the buttonbush, so named for the round clusters of flowers looking like round buttons. The species epithet, *cephalanthi* refers to the tendency of the plant to parasitize *Cephalanthus* (1,4).

Botanical synonyms (2):

Epithymum cephalanthi (Engelm.) Nieuwl. & Lunell

Grammica cephalanthi (Engelm.) W.A. Weber

FAMILY: Convolvulaceae, the morning glory family

Quick Notable Features:

- Reduced leaves and very thin stems (L.S.S. pers. obs.)
- String-like stem is 0.4-0.6mm in diameter (17)
- Tiny flowers, ~2-4mm, with translucent yellowish-white petals, growing in spicate-paniculate clusters; either sessile or short-pedicelled (1,8,16,17)
- Perianth lobes are obtuse, most often 4-merous, *not* papillate and exhibit pellucid gland dots (4,8,16,18,20)
- Apparent corolla tube (L.S.S. pers. obs. of botanical illustrations in 4,24)
- Often present on, but not restricted to *Cephalanthus* (1,14,17)



Plant Height: The height of *Cuscuta cephalanthi* is dependent on the host; H.L. Dean measured the length of a single dodder plant at nearly half a mile (19).

Subspecies/varieties recognized: None found in the literature.

Most Likely Confused with: Any other species of *Cuscuta*—in Michigan these might be: *C. coryli*, *C. epilinum*, *C. epithymum*, *C. glomerata*, *C. indecora*, *C. pentagona* or *C. polygonorum*.

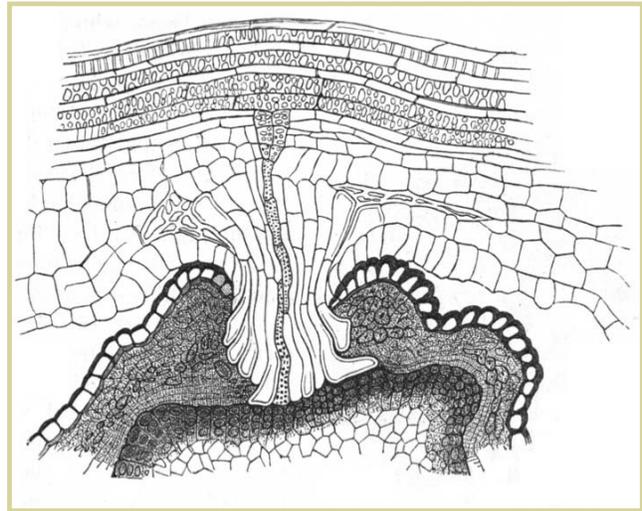
Habitat Preference: In Michigan, *C. cephalanthi* parasitizes *Amphicarpaea*, *Boehmeria*, *Cephalanthus*, *Equisetum*, *Lycopus*, *Lythrum*, *Populus*, *Salix*, *Sambucus*, *Spiraea*, *Stachys* and many Compositae (e.g., *Achillea*, *Aster*, *Cirsium*, *Eupatorium* and *Solidago*). It also inhabits the periphery of water bodies: streams, rivers, ponds, lakes, and swamps (1,2,16).

Geographic Distribution in Michigan: *C. cephalanthi* is found in 11 counties in Michigan's Lower Peninsula: Berrien, Benzie, Kalamazoo, Kent, Jackson, Ingham, Lenawee, Washtenaw, Monroe, Wayne and St. Clair (1).

Known Elevational Distribution: The altitudinal range of *C. cephalanthi* is between 0 and 3,000m in California (5).

Complete Geographic Distribution: *C. cephalanthi* is native to the continental U.S. and Canada. It is found throughout the United States, excluding the mid-west (Colorado, Wyoming, Montana), southeast (Louisiana, Mississippi, Alabama, and Florida), and a few states in the east (West Virginia, New Jersey, and Delaware) and the northeast (Vermont and New Hampshire). It is present in the following Canadian provinces: British Columbia, Alberta, Manitoba, Ontario, Nova Scotia, and New Brunswick (6).

Parasitism: Parasitism is a type of symbiotic relationship in which one organism obtains nutrients directly from a host organism. 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 organs, 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 (11). For further reading on haustoria see (22): *The Physiology of Plants Under Stress*.



Vegetative Plant Description: When individuals of *Cuscuta* germinate, they develop a short anchorage root, and a stem emerges from the seed, nutating (rotates) in search of a host. When an attachment with a host has been created, the anchorage root dies (7). Additional means of finding a host have been suggested in literature, such as positive phototropism or growth toward a source of moisture or specific chemicals (12). In *C. cephalanthi*, the stems are simple, leaves are extremely reduced to absent; the stems are string-like (0.4-0.6mm diameter) and cream-yellow-green (17).

Climbing Mechanism: In the genus *Cuscuta*, two types of coiling methods are found: loosely twining with few haustoria, and tightly twining with many haustoria—both show upward growth only; it is suggested that the former is used while the plant is in search of a host and the latter is used once contact with a host has been made (7). Typically, *Cuscuta spp.* makes no more than three turns around the same branch. (12). Kuijt states that the genus generally twines dextrally (7).

Flower Description: The flower is tiny, measuring ~2-4mm, with translucent yellow-white petals; they originate endogenously from a part of the stem called the haustorial coil (7,22), growing in cymose spicate-paniculate clusters and are sessile or short-pedicelled, ranging from 0-1.2mm. The calyx is 1-2mm, most often 4-merous, but can be 3- and 5-merous and is usually shorter than the corolla tube; its lobes are ovate and can exhibit irregular margins. The 2-4mm perianth lobes are ovate, obtuse, erect to spreading, shorter than the corolla tube, *not* papillate and exhibit pellucid gland dots. The corolla tube is cylindrical-campanulate and as it matures, it expands to cover most of the capsule. The corolla is, usually 4-parted and less commonly 3- or 5-parted (4,8,16,17,18,20). The styles are narrow and equal to or longer than the ovary, which is depressed globose-ovoid and 0.9-2mm; the stigmas are globose-capitate. The stamens are

equal in length or shorter than the corolla lobes; the anthers are ovoid to spherical and the filaments are subulate; the anthers (0.4-0.7mm) and filaments (0.2-0.6mm) are about equal in length. The presence of infra-staminal scales is important to recognize—they bear scattered processes and are oblong, nearly reaching the height of the filaments (8,16,17,20).

Flowering Time: In Ohio and the Northeast, *C. cephalanthi* flowers from August to September (4,15). In *Flora of the Great Plains*, the flowering period is listed as July-October (17).

Pollinator: Yuncker observed visits by wasps and other species of the order Hymenoptera to *Cuscuta* (8). Specific pollination information on *C. cephalanthi* was not found in the literature.



Fruit Type and Description: The fruit is a capsule 2-2.5mm in diameter, initially globose to ovoid, but later developing as depressed-globose; the corolla tube can persist around the capsule, with lobes at the summit, or fall off entirely (8,17,21).

Seed Description: In the genus *Cuscuta*, the defining characteristic of the mature embryo is the absence of cotyledons. This may be attributable to 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 *Cuscuta* seed may have zero, one, or two flat surfaces (7). In *C. cephalanthi*, the seed is 1.5-2mm long, with an outline shape varying between oval-ovoid to orbiculate; it is compressed and slightly oblique (8,17).

Dispersal Syndrome: *C. cephalanthi* is often seen growing on woody and herbaceous hosts, particularly *Cephalanthus occidentalis*, so the presence of the host is a factor in its dispersal (17). 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 (7).

Distinguished by: Close similarities between the vegetative parts of species of dodders leave one to rely on floral, fruit, and inflorescence characteristics to distinguish among the species (7). *C. cephalanthi* may be most closely related to *C. coryli* and *C. polygonorum*. The confusion point is that each of these species is usually 4-merous. *C. cephalanthi* can be distinguished by its obtuse to rounded lobes and styles that are approximately as long as the capsule. *C. coryli* contrasts with its acute, incurved lobes and styles that are shorter than the capsule. Further, some to all of the flowers in *C. coryli* are pedicellate and the perianth is papillate (1,15). *C. polygonorum* is differentiated from the above two species by its erect or ascending corolla lobes (15).

Other members of the family in Michigan (number species): In Michigan, Convolvulaceae is a small family, comprised of four genera: *Calystegia* (3), *Convolvulus* (1), *Ipomoea* (4), and *Cuscuta* with 10 species: *C. campestris* Yuncker, *C. coryli* Engelm., *C. epilinum* Weihe, *C. epithymum* (L.) L., *C. glomerata* Choisy, *C. gronovii* Schultes, *C. indecora* Choisy, *C. pentagona* Engelm. and *C. polygonorum* Engelm. (1).

Ethnobotanical Uses: “An Indian proverb states that the person finding the root of dodder will have access to all the riches of the earth” (7). 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 (10).

Phylogenetic Information: Convolvulaceae is among five other families of 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 family whose seeds exhibit physical dormancy (7). *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 (7,8,9) as well as the twining habit.



Interesting Quotation or Other

Interesting Factoid not inserted above:

Cuscuta cephalanthi, along with six other *Cuscuta* species, were originally published by George Engelmann in 1842 (13). Thereafter, he discovered that many *Cuscuta* spp. are not specific to one host, including *C. cephalanthi* to *Cephalanthus*. In a subsequent article he stated his wish to change the name to *C. tenuiflora* (14); after much discussion with Dr. Asa Gray, the names were left as is. *C. tenuiflora* was never published as a new name (avowed substitute, nomen novum), therefore *C. tenuiflora* is illegitimate (nomen superfluum). Nancy Hensold of the Field Museum kindly helped the first author interpret this information. The original description of *C. cephalanthi* is tremendous; do take a look at it online via the Biodiversity Heritage Library.

Reflecting on how the growth of *Cuscuta* impacts cultures: “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 “Teufelsxwirn” and Dutch “Duivelsnaaigaren” are vernacular names of this sort,” highlights *Cuscuta*’s standing as a noxious weed in many places (7).

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<http://www.parasiticplants.siu.edu/Cuscutaceae/index.html> led to Images 1,3, and 4:

- 1) Photo by Lytton John Musselman. Gates Co., North Carolina.
- 2) Drawing of haustoria: Haustorium von *Cuscuta epilinum* an *Linum usitatissimum* from Julius Sachs: *Vorlesungen über Pflanzenphysiologie*, zweite Auflage, Leipzig (1887), downloaded from http://commons.wikimedia.org/wiki/File:Haustorium_Cuscuta_epilinum.jpg
- 3) Photo by Joel McNeal. Plant cultivated on *Coleus* in the Pennsylvania State University greenhouse.
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