Plant Diversity Website

Cuscuta pentagona Engelmann

Common Names: Five-cornered dodder, five angled dodder, field dodder, western field dodder. Also simply called dodder or love-vine, names given generally to the genus *Cuscuta* (2,4,5,6).

Etymology: With Arabic origins, *Kushkut*, means dodder plant or parasitic plant; in New Latin, *Cuscuta* directly translates as dodder. The species name *pentagona* means "5-angled" (3,7,16).

Botanical synonyms (1):
Cuscuta arvensis var. *pentagona* (Engelm.) Engelm.
Cuscuta arvensis Beyr. ex Engelm.
Cuscuta campestris Yunck.
Grammica campestris (Yunck.) Hadač & Chrtek *Grammica pentagona* (Engelm.) W.A. Weber
Cuscuta obtusiflora Kunth (the accepted name under TROPICOS system)

FAMILY: Convolvulaceae, the morning glory family

Quick Notable Features (3,4,19)**:**
¬ Annual, pale orange, slender stems
¬ Loose cymes bearing up to 20 flowers
¬ Nearly sessile 5-merous flowers bearing angled sepals
¬ Infrastaminal scales fringed and nearly as long as the corolla tube

Plant Height: *C. pentagona* stems have been measured as longer than 12m (17).

Subspecies/varieties recognized (1)**:**
C. pentagona var. *calycina* Engelm.
C. pentagona var. *glabrior* (Engelm.) Gandhi, R.D. Thomas & S.L. Hatch
C. pentagona var. *microcalyx* Engelm.
C. pentagona var. *pentagona*
C. pentagona var. *pubescens* (Engelm.) Yunck.
C. pentagona var. *subulata* Yunck.
C. pentagona var. *verrucosa* (Engelm.) Yunck.

Most Likely Confused with: *Cuscuta indecora*, *C. cephalanthi*, *C. coryli*, *C. glomerata*, *C. gronovii*, and *C. polygonorum* (2).

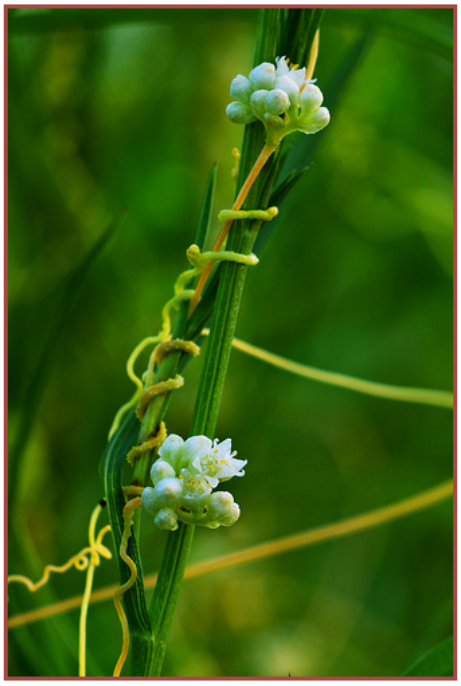
Habitat Preference: In Michigan, *C. pentagona* parasitizes species of *Rubus* (raspberries and blackberries), *Ceanothus*, *Euphorbia corollata*, *Impatiens, Chamaedaphne*, *Bidens*, grasses, clover, alfalfa, and sugar beets. It prefers forests and fields with sandy, dry soils. Along with a few other species of *Cuscuta*, *C. pentagona* must parasitize dicotyledonous plants to survive, although it may twine around monocots (2,19).

Geographic Distribution in Michigan: *C. pentagona* is found in Kalamazoo, Wayne, Calhoun, Macomb, Oakland, and Washtenaw counties (2).

Known Elevational Distribution: The species was collected at an altitude of 1798m in Plumas, CA (1).

Complete Geographic Distribution: Native to North America, the species is found in almost every state in the United States except Wyoming, Vermont, Maine, and the Virgin Islands. The species is considered introduced in Hawaii. In Canada, it is found in BC, MB, NB, NF, NS, ON, QC, SK. *C. pentagona* is also found in Argentina, Belize, Madagascar, Mexico, Suriname, Tanzania, Uganda, Venezuela, China, South Africa, Brazil, Bahamas, Cuba, Jamaica, Colombia, and Ecuador (1,5).

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 mycorrihizae 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: When *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. pentagona* are very thin (0.35-0.8mm in diameter), cylindrical, smooth, pale yellow-orange, and may bear glands; they coil around the host plant in a dextral orientation. Leaves are absent, instead there are very small, alternate scales (3,4,8,9,17,18,19).

Flower Description: The inflorescences are loose cyme heads (glomerules) bearing short pedicelled (ca. 1mm long), glandular whitish flowers (1.5-3mm long), 5-20 per glomerule. The gamosepalous calyx is 5-parted; the lobes short, broad, and apically rounded. The calyx (ca. 1.5mm long) is about the same length as the corolla tube, with lobes overlapping at the sinuses. The corolla is 5-lobed; the inflexed lobes are spreading, narrower than the sepals, lanceolate, apically acute, nearly as long as the tube, smooth, and persistent at the base of the fruit. The infrastaminal scales are oblong, fringed, and from half to as-long-as the corolla tube. Five exserted epipetalous stamens are subtended by the scales. The superior ovary is depressed-globose, 2-locular, with 2 styles (ca. 1.5mm long) shorter than the ovary or equal, with capitate stigmas (2,3,4,9,18,19,20).

Flowering Time: May until the first frost (18,20).

Pollinator: *C. pentagona* is autogamous (capable of self-pollination) and cleistogamous (flowers remain closed to avoid pollination, but seeds develop regardless) (13,19). Yuncker observed visits by wasps and other species of the order Hymenoptera to unspecified members of the genus *Cuscuta* (11).

Fruit Type and Description: The fruit is a globose capsule, 1.5-3.5mm broad and long, with the remains of the corolla at the base. The capsule can be indehiscent or dehisce irregularly. Each capsule bears up to 4 seeds (3,4,13,18,20).

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. pentagona* seeds are 1-2.2mm long, ovoid and pale yellow. 1000 seeds weigh 0.77-0.87g (3,10,13,18,19).

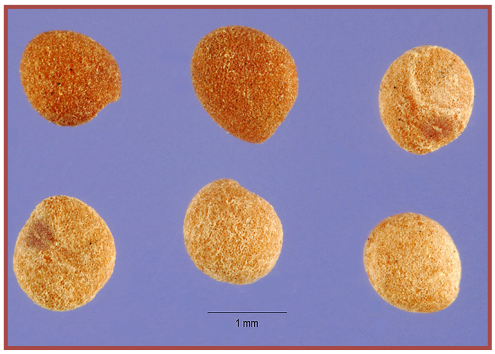
Dispersal Syndrome: In unspecified members of the genus *Cuscuta* both germination in the capsule and seeds falling to the ground were observed, leaving water dispersal or other means a possibility for dispersal. Additionally, *Cuscuta* spp. seeds may be able to pass through the intestinal tract of a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

Distinguished by: *Cuscuta indecora, C. coryli*, and *C. gronovii* have nearly round ovaries bearing a thickened “stylopodium”, the withered corolla at the apex of the capsule. In *C. pentagona*, the ovary is depressed-globose with no thickened stylopodium, and the old corolla is at the base of the capsule. Under magnification of 20x, the petals of *C. indecora* are papillate, the corolla tube is longer than the calyx, and the flower (2.5-4mm long) is larger than *C. pentagona*. Additionally, the stems are coarse, thicker than *C. pentagona*. *C. gronovii* petals are apically round and not inflexed, and the calyx is only about half the length of the corolla tube, same length in *C. pentagona*. *C. coryli*, *C. cephalanthi*, and *C. polygonorum* are 4-merous, *C. pentagona* is 5-merous. *C. coryli* infrastaminal scales are bifid, unlike *C. pentagona*, and the corolla and calyx are papillate under magnification of 20x. *C. cephalanthi* has thicker yellow stems, the apically round petals and calyx are a lot shorter than the corolla tube, and the remains of the corolla top the capsule. *C. polygonorum* calyx and petals are longer than the corolla tube, the calyx lobes apically round. The flowers of *C. glomerata* are borne in very dense, rope like inflorescences and subtended by very tiny, petaloid bracts and the calyx is unfused (2,3).

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

Ethnobotanical Uses: *C. pentagona* is used to obtain a yellow pigment used to dye wool that lasts for years (21). The following uses are for unspecified species 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 "Teufelsxwirn" 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 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 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 New Hampshire and Ohio and a special concern species in Wisconsin (5). One of the only woody species that *C. pentagona* successfully parasitizes is *Campsis radicans* (18). Many authors consider *C. campestris* and *C. pentagona* different species, but recognize that they are very close relatives (3,18,20). The Missouri Botanical Gardens lists the accepted name of this species as *Cuscuta obtusiflora* Kunth (1), but the source is a general flora, so we leave the species under *C. pentagona* here. *C. pentagona* (listed as *C. campestris*) is the second most abundant native *Cuscuta* in Canada (13).

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1. Image of plant habit in Shimane, Japan courtesy of Wildflowers of Shimane http://wildflowersofshimane.web.fc2.com/OUTSIDE_SHIMANE/Cuscuta_pentagona.htm
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4. Image of seeds courtesy of Steve Hurst @ USDA-NRCS PLANTS Database http://plants.usda.gov/java/largeImage?imageID=cupe3_001_ahp.tif

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