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First observation of field dodder and its host range in Meghalaya

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ABSTRACT

The present paper reports the first observation of a field dodder, *Cuscuta campestris* Yuncker from Meghalaya, Northeast India. Detailed field study has revealed a total of 51 host plant species, with *Mikania micrantha* Kunth., *Parthenium hysterophorus* L. and *Duranta erecta* L. being most favorable hosts. Anatomical study revealed that the parasite deteriorates the host plant by infiltrating its haustoria deep into the vascular bundles. It may also act as an economic threat to agricultural and horticultural sector in the state, as it largely reduces the host vigour and crop production. Therefore, there is an urgent need to control its invasion in the state.

Field dodder (*Cuscuta campestris*) is an annual obligate stem holoparasitic species belonging to the family Convolvulaceae (Cuscutaceae). The genus *Cuscuta* comprises of about 200 parasitic plant species, distributed throughout the tropical, subtropical and temperate regions of the world with Americas as centres of diversity (Yuncker 1932). In India, about 12 species have been documented, of which only one species (*C. reflexa*) has been reported from northeast India (Haridasan and Rao 1987). The species of the genus are without chlorophyll, have neither roots nor fully expanded leaves and the stem is only vegetative part. It twins around the leaf or stem of a suitable host plant and penetrates the host stems in order to obtain nourishment, hence weakening the host.

Globally, about 20 species of *Cuscuta* are identified as devastating weeds in agricultural and horticultural farms (Dawson *et al*. 1994). Out of 12 species reported from India, *C. campestris* and *C. reflexa* are more common (Mishra 2009). Genus *Cuscuta* has a long been used in traditional herbalism in India (Chopra *et al.* 1992). The extract of stem is used for the treatment of rheumatism, antidote for poisoning, leucorrhoea, respiratory, urinary, spleen, eye complaints, fever *etc*. (Chopra *et al*. 1992), antidandruff, anti-lice, body aches, joint pains and is believed to have anti-fertility effect (Kala *et al*. 2004).

C. campestris binds itself to a variety of host plants including agricultural crops and causes severe damage to them (Mishra *et al.* 2007). Damage can finally express to total destruction and death of the host. It reproduces mainly by seeds, which germinate under relatively high temperature and is dispersed by the wind, water, birds and animals. The seeds remain viable in the soil for about 10-30 years and may germinate throughout the year (Wisler and Norris 2005). Besides it behaves as a vector for numerous plant pathogens, such as *Cucumber Mosaic* Virus and *African Cassava Mosaic* Virus (Wisler and Norris 2005).

During a recent floristic exploration, a few specimens belonging to the genus *Cuscuta* were collected from upper parts of Umiam Lake in Meghalaya. Based on critical examination the specimens were identified as *Cuscuta campestris*. A thorough scrutiny of literature (Haridasan and Rao 1987) and records of herbarium specimens housed at Botanical Survey of India, Eastern Regional Centre, Shillong (ASSAM) and North Eastern Hill University, Shillong revealed that the species is a new record to Northeast India. The pressing and mounting of the specimen were done using standard procedures and latter deposited at Herbarium of Department of Botany, North-Eastern Hill University, Shillong, Meghalaya. The anatomical details were studied for two host plant species (*Mikania micrantha* and *Eleusine coracana*). The infected plant parts were fixed in FAA (formalin, acetic acid and ethyl alcohol, 10:5:85 v/v), followed by dehydration in the 85%, 95%, 100% ethanol and xylene, and then embedded in paraffin. The transverse section of petiole and stem of the species were taken with a rotary microtome, stained with toluidine blue O, mounted in DPX (dibutyl phthalate xylene) and observed under Labomed Cxl Microscope.

Taxonomic enumeration

Cuscuta campestris Yuncker, Mem. Torrey Bot. Club. 18: 138. 1932 **(Figure 1)**.

An annual leafless twining obligate stem parasite. Stem thin, filiform, slender, yellow or pale yellow, glabrous, ca. 0.8 mm in diam., densely branched. Leaves absent or reduced to minute scales. Inflorescence lateral, compact, branched, tightly clustered, umbelliform, 5-10 flowered, subsessile to peduncled; peduncle 2-3 mm long. Flowers hermaphrodite, white, ca. 4 mm long; bracts scale–like, light brown, ca, 0.6 mm long or sometimes obsolete; Pedicals ca. 1 mm. Calyx copular; lobes 5, obtuse-orbicular, 2-2.5 mm long, fleshy, slightly greenish in colour, glandular, glossy, covering more than half of corolla, ridged on outer surface, apex obtuse. Corolla campanulate, 3-3.5 mm long, white, flashy; lobes 5, inflexed, spreading, 0.8-1.4 x 0.5-1 mm, glossy, with reticulate venation, apex acute, fringed; tube ca. 1.5 mm long, corolla scales oblong, fimbriate above, reaching to stamens, persistent. Stamens 5, inserted at corolla throat, filament broader at the base and tapering towards the apex, subulate, longer than the anther, white, 0.4-0.6 mm long; anther oblong-elliptical to oval, ca. 0.3 mm long, yellow, exserted. Ovary sub globose, fleshy, ca. 1.5 mm long; locus 2, ovules 3-4; styles 2, filiform, thin, divergent, 1.5-2 mm long; stigma capitates or rounded ca. 0.2 mm long. Capsule depressed-globose, ca. 3 mm across, membranous, irregularly dehiscent, enclosed by persistent sepal lobes, petals and stamens. Seeds 2-4 in each capsule, broadly ovate, flattened on one side, 1-2 mm long, pale brown, scabrous. Flowering and fruiting: throughout the year.

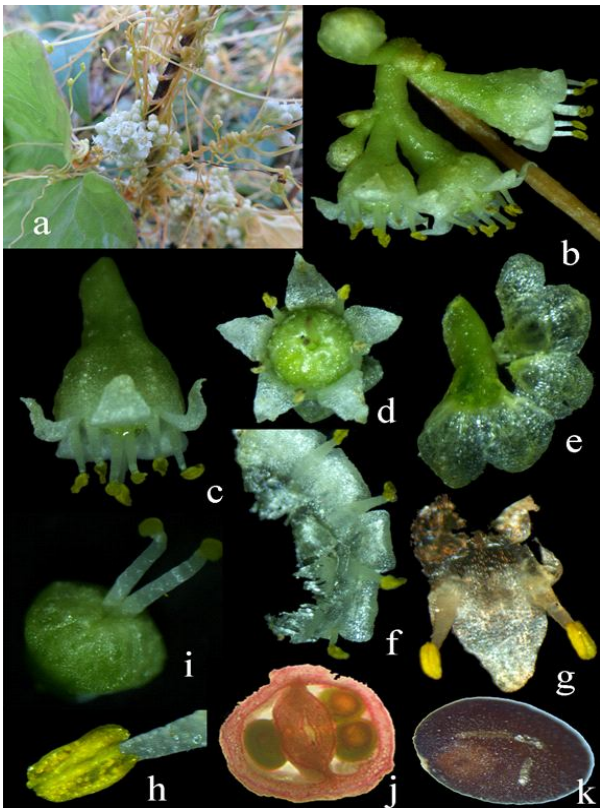

Figure 1. ***C. campestris*** **(a) Habit, (b) Inflorescence, (c) & (d) Individual flower in full bloom, (e) Sepals, (f) Dissected petals with fimbriation, (g) Single petal lobe with attached stamens, (h) Stamen, (i) Gynoecium, (j) T.S. of ovary and (k) Seed**

Specimen examined: India, Meghalaya, East Khasi Hill District, 25^0 40.151' N and 91^0 45.291' E, 1015 m asl, road side Umiam lake area, 12054, 08 May 2016, N. A. Bhat, Department of Botany, North-Eastern Hill University, Shillong (NEHU).

Distribution: Asia (China, India, Afghanistan, Indonesia, Japan, Kazakhstan, Korea, Mongolia, Sri Lanka) Russia, Africa, Australia.

Host range

During the current study, a total of 51 plant species, including 30 herbs, 15 shrubs, 4 climbers and 2 trees were found to be hosted by *C. campestris* (**Table 1**). Mostly herbs were found to be affected by the parasite, while the trees are resistant. *M. micrantha* Kunth, *Parthenium hysterophorus* L. and *Duranta erecta* L. were observed as the most preferred host plants. *Vitex negundo* and *Duranta plumier* has also been reported as favourable host plants for the

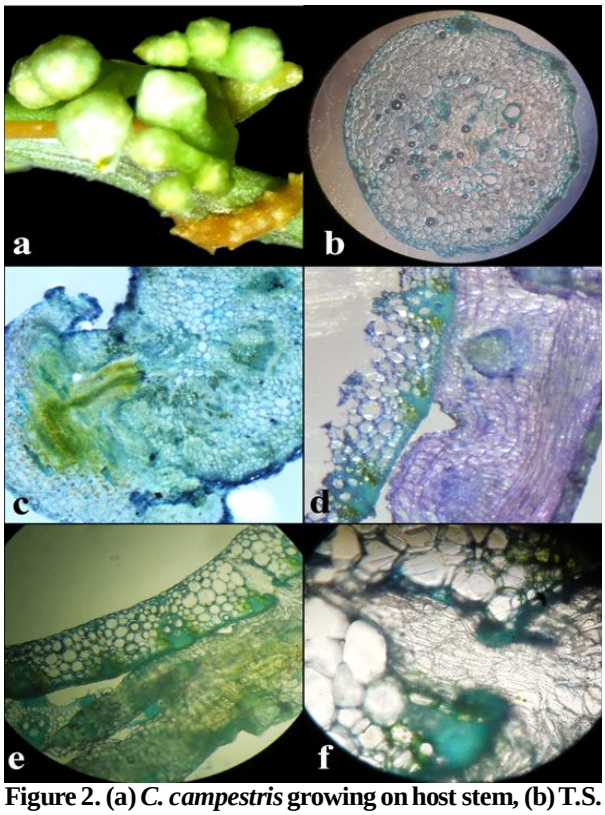

Figure 2. (a) ***C. campestris*** **growing on host stem, (b) T.S. of parasite stem showing haustorial initials (HI), (c) Parasite binding with** ***Mikania micrantha*****, (d, e and f) Development and penetration of haustoria into the vascular bundle of** ***Eleusine coracana***

Table 1. List of host plants infected by *C. campestris* in Meghalaya

Host species	Family	Habit	Part infected
Sambucus javanica Blume	Adoxaceae	S	L
Achyranthes aspera L.	Amaranthaceae	H	L/ST
Alternanthera sessilis (L.) R.Br. ex DC.	Amaranthaceae	H	L/F
Chenopodium album L.	Amaranthaceae	H	L/ST/I
Iresine herbstii Hook.	Amaranthaceae	H	L/ST
Catharanthus roseus (L.) G.Don	Apocynaceae	S	L/ST
Tabernaemontana divaricate (L.) R.Br.	Apocynaceae	S	L/F
Xanthium strumarium L.	Asteraceae	S	L/ST/I
Bidens pilosa L.	Asteraceae	H	L/ST
Parthenium hysterophorus L.	Asteraceae	H	L/ST
Mikania micrantha Kunth	Asteraceae	C	L/ST/I
Ageratina adenophora (Spreng) R.M. King & H.Rob.	Asteraceae	H	L/ST/I
Erigeron bonariensis L.	Asteraceae	H	L/ST
Artemisia nilagirica (C.B. Clarke) Pamp.	Asteraceae	H	L/ST/I
Crassocephalum crepidioides (Benth.) S.Moore	Asteraceae	H	L/ST/I
Ipomoea indica (Burm.) Merr.	Convolvulaceae	C	L/ST
Cyperus iria L.	Cyperaceae	H	L
Ricinus communis L.	Euphorbiaceae	S	L/ST
Euphorbia hirta L.	Euphorbiaceae	H	L/ST
Trifolium repens L.	Fabaceae	H	L/ST
Flemingia strobilifera (L.) W.T. Aiton	Fabaceae	S	L/I
Callicarpa arborea Roxb.	Lamiaceae	T	L
Vitex negundo L.	Lamiaceae	S	L/ST/I
Clerodendrum infortunatum L.	Lamiaceae	S	L/ST
Sida acuta Burm.f.	Malvaceae	H	L/ST
Hibiscus rosa-sinensis L.	Malvaceae	S	L/ST
Hibiscus surattensis L.	Malvaceae	C	L/ST
Urena lobata L.	Malvaceae	S	L/ST
Oxalis corniculata L.	Oxalidaceae	H	L/ST/F
Phyllanthus urinaria L.	Phyllanthaceae	H	L/ST/F
Phytolacca acinosa Roxb	Phytolaccaceae	H	L/ST
Plantago asiatica L.	Plantaginaceae	H	L
Paspalum conjugatum P.J. Bergius	Poaceae	H	L
Oryza sativa L.	Poaceae	H	L
Eleusine coracana (L.) Gaertn.	Poaceae	H	L
Paspalum scrobiculatum L.	Poaceae	H	L
Imperata cylindrica (L.) Raeusch.	Poaceae	H	L
Poa annua L.	Poaceae	H	L
Fagopyrum esculentum Moench	Polygonaceae	H	L/ST/I
Persicaria barbata (L.) H. Hara	Polygonaceae	H	L/ST
Rubus ellipticus Sm.	Rosaceae	S	L
Citrus medica L.	Rutaceae	T	L
Solanum americanum Mill.	Solanaceae	H	L/ST
Brugmansia suaveolens (Humb. & Bonpl. ex Willd.) Bercht. & J.Presl	Solanaceae	S	L/ST/F
Solanum aculeatissimum Jacq.	Solanaceae	H	L/ST/F
Solanum torvum Sw.	Solanaceae	S	L/ST
Nicandra physalodes (L.) Gaertn.	Solanaceae	H	L/ST/F
Boehmeria macrophylla Hornem.	Urticaceae	H	L/ST
Duranta erecta L.	Verbenaceae	S	L/ST
Lantana camara L.	Verbenaceae	S	L/ST
Sechium edule (Jacq.) Sw.	Cucurbitaceae	C	L/ST

Legend: H= Herb, S= Shrub, T= Tree, C= Climber, L= Leaves, ST= Stem, F= Flower, I= Inflorescence

species (Nikam *et al*. 2014). Monocot species are considered to be resistant to *Cuscuta* invasion, probably because of barriers formed by anatomical positions such as the arrangement of vascular bundles or incompatibility of signals that are important for forming interspecies connections of vascular strands or by direct defense response applied by the host (Dawson *et al*. 1994). But in our study, we observed that monocotyledons (*P. conjugatum, E. coracana* and *I. cylindrical*) were also affected by the parasite.

The starting point of infection in the host is the appearance of adhesive elongated disk like structure. The anatomical sections of a monocot (*E. coracana*) and dicot (*M. micrantha*) host stem showed a notable variation (**Figure 2**). In the case of *M. micrantha*, haustorium penetrates into the stem, while in *E. coracana*, it affects only the leaves. The prevention of haustoria penetration to monocot stem could be because of lignified tissues and absence of epidermal hairs or sclerenchymatous hypodermis in monocots (Dawson *et al*. 1994). The attachment zone showed that the epidermal and cortical cells are destroyed by the penetration of the haustoria of the weed, which latter establishes the link between xylem vessels and sieve-tubes. Haustoria originate from the cortical parenchyma cells of the pericycle, undergo a high rate of proliferation and reach the vascular tissues of the host by rupturing the bulliform cells in order to obtain nourishment.

REFERENCES

Chopra RN, Nayer SL and Chopra IC. 1992. *Glossary of Indian Medicinal Plants* CSIR publication, New Delhi, 85p.

Dawson, JH, Musselman LJ, Wolswinkel P and Dorr I. 1994. Biology and control of *Cuscuta*. *Reviews of Weed Science* **6:** 265-317.

Haridason K and Rao RR. 1987. *Forest flora of Meghalaya*. Vol. II. Bishen Singh and Mahendra Pal Singh, Dehradun pp. 635-650.

Kala CP, Farooquee NA and Dhar U. 2004. Prioritization of medicinal plants on the basis of available knowledge, existing practices and use value status in Uttaranchal, India. *Biodiversity and Conservation* **13**: 453-469.

Mishra JS. 2009. Biology and management of *Cuscuta* species. *Indian Journal of Weed Science* **44** (1&2): 1-11.

Mishra JS, Moorthy BTS, Bhan M and Yadurajy NT. 2007. Relative tolerance of rainy season crops to field dodder (*Cuscuta campestris*) and its management in niger (*Guizotia abyssinica*). *Crop Protection* **26**(4): 625-629.

Nikam SS, Pawar SB and Kanade MB. 2014. Study of *Cuscuta reflexa* Roxb. with reference to host diversity, anatomy and biochemistry. *European Journal of Experimental Biology* **3**(2): 6-12.

Wisler GC and Norris RF. 2005. Interactions between weeds and cultivated plants as related to management of plant pathogens. *Weed Science* **53**(6): 914-917.

Yuncker TG. 1932. The genus *Cuscuta*. *Memoirs of the Torrey Botanical Club* **18**: 113-331.