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Cuscuta campestris Yunck., A NEW PEST OF *Capsicum frutescens* L. (HOT CHILLI) IN LAHORE-PAKISTAN

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ABSTRACT

Cuscuta campestris Yunck. is a leafless parasitic weed species belonging to the family Convolvulaceae. During weed survey in July and August 2010, C. campestris was abundantly found parasitizing Capsicum frutescens L. (hot chilli) in the premises of Lahore, Pakistan. Taxonomy and morphological characteristics of C. campestris and its effects on new host have been discussed in this paper. C. campestris is a new pest of C. frutescens, recorded in Lahore region.

Key words: *Cuscuta campestris*, *Capsicum frutescens*, taxonomy, host, parasitic weed.

INTRODUCTION

The genus *Cuscuta* L. (dodder) contains 180 obligatory parasitic species (Yuncker, 1932; Mabberley, 2008), distributed in a wide range of habitats mostly in temperate and subtropical regions of the world. *Cuscuta campestris* is the most widespread species in the genus in the world. It is the only parasitic weed of North America that has spread to the Old World (Dawson *et al.*, 1994). It obtains its resources entirely from its host plants, severely suppressing them and even resulting in their death (Ashton and Santana, 1976; Cooke and Black, 1987; Dawson *et al.*, 1994). This parasite has a wide range of host species (Yuncker, 1932; Parker *et al.*, 1984; Nemli, 1986). It mainly parasitizes alfalfa, but also attacks some horticultural crops, legumes, and broadleaved weeds, though it is seldom found on woody plants, grasses, or cereals. Although it normally grows as an annual (Dawson *et al.*, 1994), its shoots can stay alive in winter, and its seeds may germinate and then infect host plants in the following spring (Wang *et al*., 2002).

Capsicum frutescens L. (hot chilli) is an important agricultural crop due to economic, nutritional and medicinal values of its fruits. Hot chilli production in Pakistan not only fulfills domestic needs but also helps in earning foreign exchange. Pakistan earned Rs. 192.32 million during 2004-05 by exporting red chilli pepper to Middle East, USA and other countries (Amjad and Anjum, 2007). *Capsicum frutescens* is a summer vegetable grown widely in southern Punjab and Sindh, Pakistan. In Punjab, acreage under *C. frutescens* is increasing due to a shift in production trend from cotton based farming to non-traditional

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crop production which in turn is due to a decline in income from cotton crop. *Capsicum frutescens* planting time in Punjab starts from mid February and fruit pickings continue up to August. During weed survey in July and August 2010, *C. campestris* was abundantly found parasitizing *C. frutescens* L. (hot chilli) in Lahore, Pakistan. This manuscript is a first report on new host range of *C. campestris* in Lahore, Pakistan.

MATERIALS AND METHODS

Survey and identification

Extensive survey was undertaken during January 2009- June 2010 at different *C. frutescens* L. growing field areas in Lahore, Pakistan. The *Cuscuta* species samples were collected from different infested fields of *C. frutescens* (Figs. 1 & 2). Preliminary identification of the collected specimens was made in the field then further identified using the published literature and, volumes of the Flora of Pakistan (Yuncker, 1932; Nasir and Ali, 1972; Nasir and Rafiq, 1995; Parker and Ritchie, 1993; Rajput and Tahir, 1988; Athar *et al.*, 2007) and by comparing with authentic herbarium specimens (Table-1) and finally confirmed by the assistance of taxonomists.

Table-1. Herbarium specimen (voucher) of *Cuscuta campestris*.

Voucher number	KUH 8544 ; KUH 268; KUH 392; KUH 15; KUH 8542; KUH 8545
Herbarium (or collector)	Karachi University Herbarium (KUH)
Taxon name on voucher	*Cuscuta campestris* Yunck.
Voucher number	PTBG0000000358
Herbarium (or collector)	National Tropical Botanical Garden
Taxon name on voucher	*Cuscuta campestris* Yunck.
Voucher number	BISH0001000164
Herbarium (or collector)	Bishop Museum
Taxon name on voucher	*Cuscuta campestris* Yunck.

General Morphology of the *Cuscuta campestris*

Cuscuta campestris is a parasitic annual weed that is rather fleshy and smooth. The stems are thin, circular in cross section and extensively-branched. The stem color is pale yellow to golden yellow, 0.2-0.4mm in diameter and smooth (Fig. 3A). Inflorescence cymose clusters in loose glomerules 5-15 in number. Pentamerous, pedicellate flower, 1.2-2 mm in diameter with 0.5mm pedicel. Inflorescence bracts 0.8 × 0.5mm and ovate (Fig. 3B). Calyx light green, shorter than the corolla tube, smooth, 5 sepals, 1.2× 0.8mm, broadly ovate, sub acute, with entire margins, not thickened, erect and fused at the

base. Calyx margin was entire (Fig. 3C). Corolla tube longer than the calyx, 5 petals, smooth whitish, 1.2× 0.8mm, ovate to sub acute not thickened at the margins fused at the base, margin were entire. Stamens epipetalus, 5 in number, filament broader at the base, tapering towards the apex, 0.3-0.7mm long, shorter than the corolla; filaments flat 0.2 mm long; anthers 0.5mm ovoid, some what triangular, yellow, bigger than the filaments (Fig. 3D). Corolla scales 0.6× 0.4 mm oblong, well developed, entire and convergent over the subglobose ovary, highly fimbriate; whitish green bilocular ovary, superior with diameter 0.5mm, 4-ovuled, ovule 0.2mm in diameter slightly triradiated; styles 2, 1mm long; stigmas reddish-brown capitate (Fig. 3E). Mature fruit size 3mm in diameter. Immature seed 1mm, yellow green in color (Fig. 3F), turn brown on maturity. This species is closely related to *Cuscuta europaea* from which it can be separated by its capitate stigma, capsule not circumscissile with a definite line of cleavage, and also by its inflexed petals.

A verity of parasitic weeds including *Cuscuta* species, have been reported in different corps in Pakistan (Marwat, *et al.,* 1993; Athar and Shabbir, 2008), however, *Cuscuta campestris* has not been reported from *C. frutescens* in pervious literature.

RESULTS AND DISSUCSSION

During the survey, *C. frutescens* plants were found infested by *C. campestris*. In general, it grows as an annual (Dawson *et al.,* 1994), its shoots can stay alive in winter, and its seeds may germinate and then infect host plants in the following spring (Wang *et al.,* 2002). In the month of July and August, the spell of rains starts which in Pakistan favors the *C. campestris* attack on *C. frutescens* plants (Fig. 1 & 2). It was observed that infected plants did not flower at all. *Cuscuta campestris* significantly reduced the number of flowers, leaves and fruits formation in those plants where its stem invaded later. *Cuscuta campestris* also significantly reduced stem elongation of the infected plants as compared to healthy *C. frutescens* plants in field. Farah and Al-Abdulsalam (2004) has also reported that *C. campestris* can cause variable reductions in the vegetative (plant height, number of leaves plant^{-1}, dry weights of shoot and root systems) and reproductive (number of flowers plant^{-1} and number of pods plant^{-1} traits of host crops.

Cuscuta species have important medicinal, pharmacological, and edible values while others are a threat to the natural ecosystems and agricultural crops (Jayasinghe *et al.,* 2004). *Cuscuta campestris* and *C. reflexa* are more common parasitic weeds all over the world. These weeds have been reported as a major problem in pulses, oilseeds and fodder crops in the various states (Andhra Pradesh,

Chhattisgarh, Gujarat, Orissa, Madhya Pradesh) of India, West Bengal, under rainfed as well as in irrigated conditions (Mishra, 2009). The yield reductions due to *Cuscuta* species infestation are reported 60–65% in chillies (*C. frutescens* L.), 31–34% in green gram / black gram (*Vigna mungo* (L.) Hepper), 87% in lentil (*Lens culinaris* Miller), 86% in chickpea (*Cicer arietinum* L.), 72% in tomato (*Solanum lycopersicum* L.) and 60–70% in alfalfa (*Medicago sativa* L.) (Mishra, 2009). The economic importance of *C. campestris* stems from the fact that it parasitizes several important crop plants and reduces their yield substantially. In addition, this parasitic weed has become one of the most important constraints that limit productivity of crops in various parts of the world (Farah and Al-Abdulsalam, 2004). Eighteen *Cuscuta* species have been reported from Pakistan by different workers (Rajput and Tahir, 1988; Athar *et al.,* 2007). However, sufficient information is lacking on *Cuscuta campestris* and its host range in Pakistan (Perveen and Qaiser, 2004; Athar *et al.,* 2007; Kanwal *et al.,* 2010). The presence of *Cuscuta campestris* weed is a serious concern for chilli pepper exporters from Pakistan. The resistant varieties of *C. frutescens* should be used in order to combat the menace of this serious parasite.

Voucher number:	IRM00205
Herbarium (or collector):	Institute of the Plant Pathology, University of the Punjab Lahore
Taxon name on voucher:	*Cuscuta campestris*
Represents which PIER taxon:	*Cuscuta campestris* (Cuscutaceae)
Local name:	n/a
Region:	South Asia
Country:	Pakistan
Town/city:	Lahore
Locality:	Wagha Border
Habitat:	Parasitic vine on chill plant; stems pale yellowish-green to golden yellow; flowers very greenish-white.
Collector:	Irum Mukhtar
Collection date:	7/16/2010

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Figure 1. *Cuscuta campestris* attack on *Capsicum frutescens*.

Figure 2. Effect of *Cuscuta campestris* on the growth of host plant.

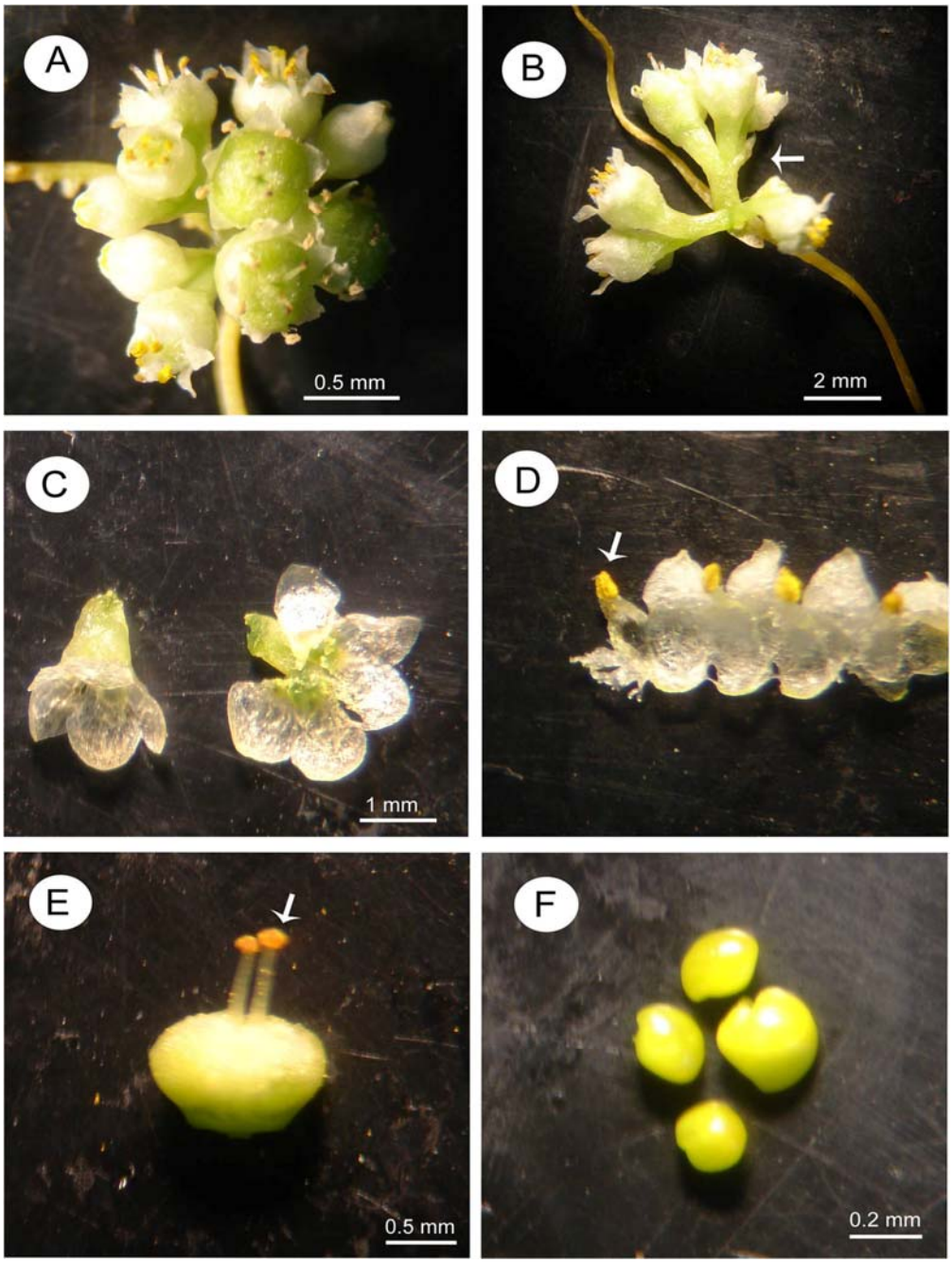

Figure 3. A: Inflorescence; B. Bract; C. Calyx; D. Corolla with stamens; E. Bilocular ovary; F. Seeds.

REFERENCES CITED

Amjad, M. and M.A. Anjum. 2007. Effect of post-irradiation aging on onion seeds. Acta Physiologica Plantarum, 29: 63-69.

Ashton, F.M. and D. Santana. 1976. *Cuscuta* spp. (dodder): a literature review of its biology and control. University of California Berkeley: Division of Agricultural Science Cooper. Ext. Bull. 1880.

Athar, M. and S.M. Shabbir. 2008. Nodulating leguminous weeds of some major crops of Pakistan. Phytologia 90: 246-251.

Athar, M., A.H. Chaudhary, Z. Yousaf and S.M. Shabbir. 2007. Taxonomic reflections on the parasitic angiosperms of Pakistan. Phytologia 89(3): 339-347.

Cooke, D.A. and I.D. Black. 1987. Biology and control of Cuscuta campestris and other *Cuscuta* spp.: a bibliographic review. Adelaide, South Australia: South Australian Department of Agriculture Technical Paper No. 18.

Dawson, J.H., L.J. Musselman, P. Wolswinkel and I. Dorr. 1994. Biology and control of *Cuscuta*. Rev. Weed Sci. 6: 265–317.

Farah, A.F. and M.A. Al-Abdulsalam. 2004. Effect of Field Dodder (*Cuscuta campestris* Yuncker) on Some Legume Crops. Scientific J. King Faisal Univ. Basic and Appl. Sci. 5:103-110.

Jayasinghe, C., D.S.A. Wijesundara, K.U. Tennakoon and B. Marambe. 2004. *Cuscuta* species in the lowlands of Sri Lanka, their host range and host-parasite association. Tropical Agric. Res. 16: 223–241.

Kanwal, D., R. Abid and M. Qaiser. 2010. The seed atlas of Pakistan-iii. Cuscutaceae. Pak. J. Bot. 42(2): 703-709.

Mabberley, D.J. 2008. *The plant-book*, 3rd edition. Cambridge University press, Cambridge, New York.

Marwat, K.B., G.R. Marwat and F.M. Sarim. 1993. A checklist and key to parasitic weeds of Pakistan. Pak. J. Weed Sci. Res. 6 (1-2): 1-15.

Mishra, J.S. 2009. Biology and Management of *Cuscuta* species. Indian J. Weed Sci., 41:1-11.

Nasir, E. and S.I. Ali. 1972. An annotated flora of West Pakistan. Stewart Herbarium Gordon College, Rawalpindi and Department of Botany, University of Karachi, Pakistan.

Nasir, Y.J. and R.A. Rafiq. 1995. Wild flowers of Pakistan. Elite Publishers Ltd., Islamabad, Pakistan.

Nemli, Y. 1986. Investigation on dodder species (*Cuscuta* spp.) and their host and distribution in cultivated area of Anatolia, Ege Universitesi Ziraat Fakultisi Dergisi, 23: 11-21. Weed Absts. 38: 51; 1989.

Parker, C., and C.R. Ritchie. 1993. *Parasitic Weeds of the World: Biology and Control*. CAB International, Wallingford, UK.

Parker, C., L.J. Musselman, R.M. Polhill and A.K. Wilson. 1984. Proceedings of the third international symposium on parasitic weeds. Aleppo, Syria, 1984. Aleppo: The International Center for Agricultural Research in the Dry Areas (ICARDA).

Perveen, A. and M. Qaiser. 2004. Pollen flora of Pakistan–XLI. *Cuscutaceae*. Pak. J. Bot. 36(3): 475-480.

Rajput, M.T.M. and S.S. Tahir. 1988. Cuscutaceae *In* E. Nasir and S.I. Ali (Eds.) Flora of Pakistan, Karachi, 189: 1-24.

Wang, B.S., M.G. Li, P. Yu, W.B. Liao and Q.J. Zan. 2002. The parasitic characteristics of *Cuscuta* spp. and their utilization. Acta Scientiarum Naturalium Universitatis Sunyatseni 41: 49-53.

Yuncker, T.G. 1932. The genus *Cuscuta*. *Memoirs of the Torrey Botanical Club* 18:109–331.