

***Cuscuta pedicellata* (CONVOLVULACEAE): A NEW PARASITIC WEED RECORDED FROM PAKISTAN**

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ABSTRACT

The Cuscuta pedicellata L. is an angiospermic leafless parasitic plant belonging to the family Convolvulaceae was abundantly found parasitizing two host plants including the Trifolium alexandrinum L. (a fodder crop) and Duranta erecta (an ornamental plant used as fence) in the premises of Lahore, Pakistan. The taxonomical and morphological characteristics of C. pedicellata have been discussed in this paper. C. pedicellata has therefore become a new addition in the flora of Pakistan.

Keywords: *Cuscuta pedicellata*, *Duranta erecta*, flora of Pakistan, parasitic, taxonomy *Trifolium* species.

INTRODUCTION

Angiosperm parasites in primary habitats are an integral part of an ecosystem. They behave as "prudent predators" and are adapted to life cycle of their principal hosts. Approximately 3,900 species of parasitic plants have been recorded (Nickrent, 2002), amounting to more than 1% of the flowering plants. The genus *Cuscuta* L. (dodder) is composed of approximately 150 tiny herbaceous obligatory parasitic species (Parker and Ritchie, 1993; Dawson *et al.*, 1994; Press, 1995; Hibberd *et al.*, 1998) and they are widely distributed, mostly in temperate and subtropical areas of the world. Some species invade more than one host and some others are host specific and all are damaging. They parasitize a large number of crop plants, especially some pasture legumes, such as species of *Trifolium* and *Medicago*. Dodders affect the growth and yield of infected plants. Losses range from slight to complete destruction of the crop in infected areas (Agrios, 1997). Various *Cuscuta* species have also been reported in different corps in Pakistan (Marwat *et al.*, 1993; Mukhtar *et al.*, 2011).

Dodders are holoparasitic annuals and are usually observed as dense tangles of fine, yellow-orange, much-branched stems in the foliage of host plants. According to the conservative view the genus was classified in Convolvulaceae under the subfamily Cuscutoidae (Engelmann, 1859; Bentham and Hooker, 1862; Engler, 1964; Hutchinson and Ashton, 1979). Impressed mainly by the mode of nutrition, other authors segregated it into a family of its own viz.

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Cuscutaceae Dum. (Hutchinson, 1959; Cronquist, 1968; Hadać and Chrtek, 1970; Austin, 1975; Takhtajan, 1980). This segregation relied on different criteria, either on macro-floral characters especially the infra-staminal scales (Severova, 1991), on floral anatomy (Govil and Lavania, 1980) or embryological characters (Tiagi, 1951; Johri and Tiagi, 1952; Johri, 1987).

The genus itself was divided by Engelmänn (1859), when placed in Convolvulaceae, into three subgenera viz. *Cuscuta*, *Monogyna*, *Grammica*. Hadać and Chrtek (1970), on the basis of floral characters, accepted the Cuscutaceae but they added one more subgenus (*Kadurias*) to Engelmänn's sub-genera. However, they also stated (*op. cit.*) that embryological data do not support such division since the bisporic embryo sac is present in members of all the four subgenera. Chapter 5 in *Parasitic Weeds of the World: Biology and Control* (Parker and Ritchie, 1993) contains a key and detailed descriptions of various dodder species. This key divides the Genus *Cuscuta* into three Sections: (1) one style, supporting two stigmas Section *Monogyna*, (2) two styles, stigmas linear, without knobs Section *Cuscuta*, (3) two styles, capitate, with knobs Section *Grammica*.

Species of the genus *Cuscuta* (Cuscutaceae) are phanerogamic stem parasites, which are distributed world-wide. In the revision of Yuncker (1932) more than 150 different species are listed, many of which are difficult to identify or distinguish from neighbouring ones. The taxonomic characters of the genus are limited almost entirely to the flower, fruit, and inflorescence, as the vegetative parts of the plants are very simple in structure and show great uniformity (Löffler et al., 1997). In early literature, only *C. reflexa* (Parker, 1956; Kashyap et al., 1936) was reported. In Holm et al. (1979), *C. reflexa* is listed as a 'principal' or 'serious' weed in Afghanistan, Nepal, India and Pakistan. *Cuscuta pedicellata* is a new report, parasitizing two host plant viz. *Trifolium pratense* (fodder crop) and *Duranta erecta* (ornamental plant used as fence). *Trifolium* species has been reported as specific host of this parasite (Parbery, 1980).

Cuscuta pedicellata differ in series of characteristics that make it easy to distinguish from other reported *cuscuta* species from Pakistan (Kashyap, et al., 1936; Rajput & Tahir, 1988; Yuncker, 1932; Athar et al., 2007; Garcia and Martin, 2007). These characters are: (1) thin and many branched stems, (2) tetramerous to pentamerous and small flowers on pedicels (3) narrow and calculate petals, and (4) a shorter calyx clearly shorter than corolla tube not over lapping lobes.

General Morphology of the *Cucuta pedicilata*

Cucuta pedicellata is a parasitic annual weed that is rather fleshy and smooth. The stems are circular in cross section and much-

branched (Fig. 1). The stem color is pale yellow to yellowish green, 0.2-0.5 mm in diameter and many branched smooth. Inflorescence cymose clusters in loose glomerules 2, 3, 4 and 5 in number and 4-5mm diameter. Tetramerous to pentamerous, pedicelate flower, 1.5-2mm in diameter with 1-1.2mm pedicel (Fig. 2), inflorescence bracts 1×0.5 mm, ovate (Fig. 3B). Calyx whitish green, shorter than the corolla tube, smooth, 5 sepals, 1×0.8 mm, broadly ovate, sub acute, with entire margins, not thickened, erect, fused at the base. Calyx margin were entire (Fig. 3A). Corolla tube longer than the calyx, 4-5 petals, smooth whitish, 1.6 mm long, ovate to sub acute not thickened at the margins fused at the base, margin were entire . Stamens epipetalus, 4-5 in number, 0.5-0.7 long mm, shorter than the corolla; filaments flat 0.5 mm long; anthers 0.2mm ovoid, some what triangular, yellow, shorter than the filaments. Corolla scales 1- 0.8×0.4 mm oblong, well developed, entire and convergent over the subglobose ovary, fimbriate (Fig. 3E). Whitish green ovary with Style reduced to short, 2-3 conical projections of the ovary with 4 imiture subglobose green ovules of 0.5-1mm diameter (Fig. 3D & F). This new species of *Cuscuta* was identified on the basis of keys (Parker and Ritchie, 1993; Garcia, 1998).



Figure 1. Habitat of plant growing on *Trifolium alexandrinum*.



Figure 2. Inflorescence of plant.

Key to the most important *Cuscuta* species (Parker and Ritchie, 1993)

A. One style, supporting two stigmas (section *Monogyna*)

Style shorter than the elongated stigmas, flowers 6-8 mm long, white with purplish rim. Calyx very short. Capsule conical 5-8 mm long, seeds 3-3.5 mm. Mainly Central to Eastern Asia (*C. reflexa*).

Style about as long as stigmas, all extremely short, flowers 3-4 mm, calyx with broad fleshy lobes, almost equalling corolla tube. Capsule elongated, cone-shaped, 6 mm long. Seeds 3-3.5 mm. Mainly in the Middle East (*C. monogyna*).

Style about twice as long as stigmas, flowers 3-4 mm long, in elongated clusters, sometimes red-spotted, calyx much shorter than corolla tube, the lobes narrower than above. Seeds 2-3 mm long. Mainly in Europe (*C. lupuliformis*).

Style much longer than the short stigmas, flowers 3-4 mm long in elongated clusters. Seeds about 3 mm long. Mainly in E. Asia.
.....*C. japonica*

B. Two styles, stigmas linear, without knobs (section *Cuscuta*)

Perianth mostly 4-parted:

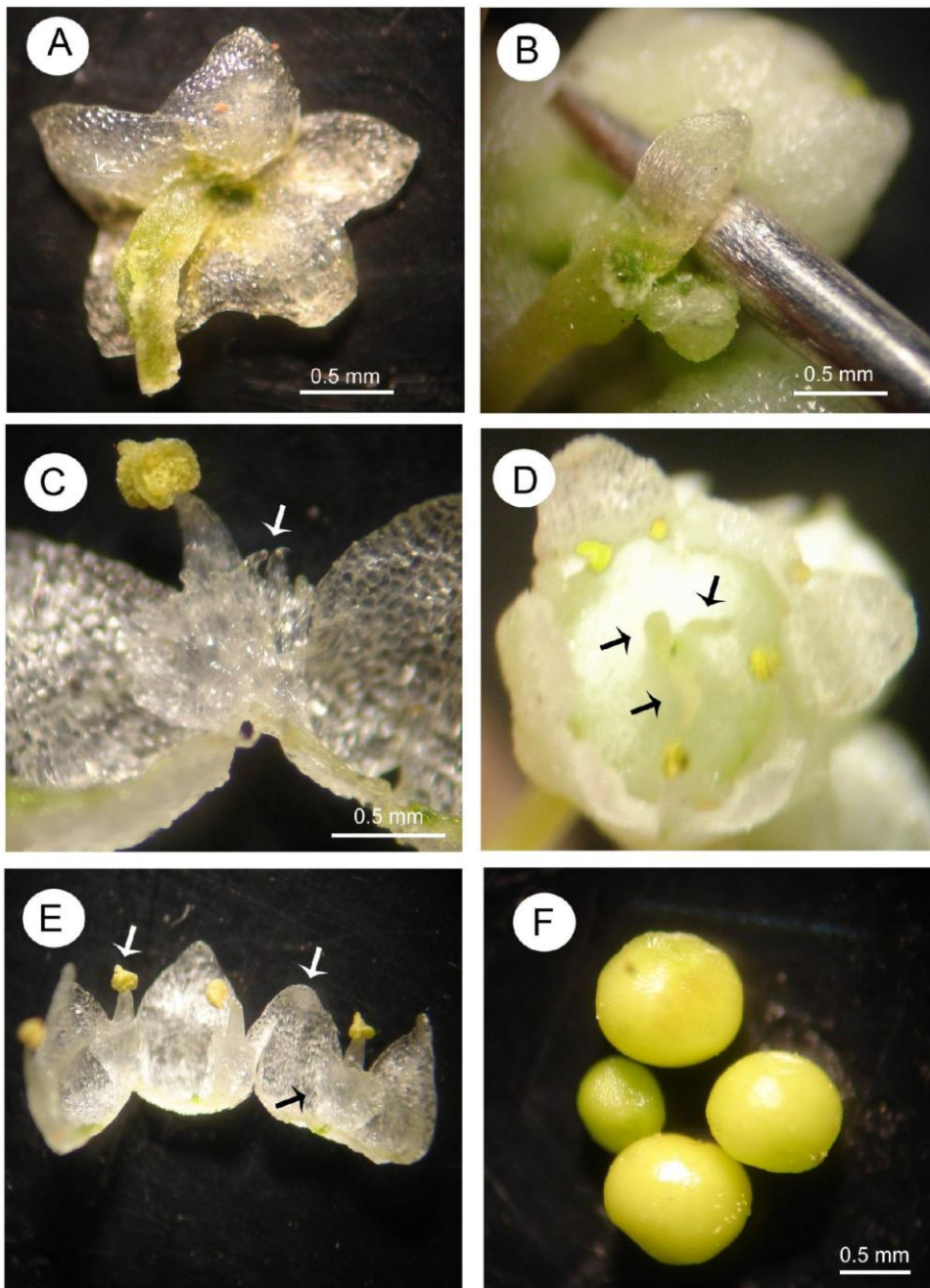


Figure 3. A: Calyx with pedicel. B: Bract. C: Corolla scale. D: Trilobed ovary. E: Open corolla showing petals, stamens and corolla scales. F: Seeds.

Flowers 2-3 mm, pedicelled, in loose heads of 3-8 flowers. Stigmas subsessile. Capsule round, closely enclosed by corolla. Seeds about 1.25 mm. Mainly W. and Central Asia (*C. pedicellata*).

Flowers 1.5-2 mm, sessile in very small, dense heads 4-6 mm across; corolla lobes with erect hooded tips. Capsule round. Seeds about 1 mm. Mainly E. Mediterranean (*C. palaestina*).

Perianth mostly 5-parted:

Calyx lobes fleshy at least at the tip, flowers 1.5-2.5 mm, sessile in heads 5-6 mm across. Capsule round, enveloped in corolla. Seeds about 1 mm. Widespread (*C. planiflora*).

Calyx lobes membranous:

Flowers 3 mm long in heads 10-15 mm across; styles plus stigmas shorter than the ovary. Capsule roughly round. Seeds about 1.2 mm. Only in flax and linseed fields. Widespread (*C. epilinum*).

Stems slender, reddish. Flowers 3-4 mm in dense heads 7-10 mm across, styles plus stigmas slightly longer than ovary. Seeds about 1 mm. Mainly Europe (*C. epithymum*).

C. Two styles, capitate, with knobs (section Grammica)

Flowers granulate, covered with minute protuberances, 2-2.5 mm long on distinct pedicels. Seeds about 1.5 mm. Mainly N. and C. America and Caribbean (*C. indecora*).

Flowers not granulate:

Capsule enclosed in corolla:

Flowers 2-4 mm long, pedicelled, in a loose head, somewhat glandular, corolla lobes deflexed. Corolla persisting as a cap on the capsule. Seeds about 1.5 mm. Mainly N. America (*C. gronovii*).

Flowers 2-3.5 mm in dense heads. Corolla lobes fleshy at the tip. Capsule 3-4 mm across, enclosed tightly by corolla, circumscissile. Seeds about 1.2 mm. Mainly in E. Asia (*C. chinensis*).

Capsule exposed:

Flowers about 2 mm, in compact heads. Corolla lobes obtuse. Seeds about 1.5 mm. Sometimes reddish-glandular on capsule. distinct crater between styles. Infrastaminal scales bifid. Widespread through Europe and Asia (*C. australis*).

Flowers 2-3 mm, in compact heads 10-12 mm across. Corolla lobes acute, often flexed upwards. Capsule round, 2-3 mm across, not concealed by corolla. Infrastaminal scales exserted, fimbriate, not bifid. Seeds 1-1.5 mm. Very widespread..... (*C. campestris*).

Key to the taxa of *Cuscuta* sub genus *Cuscuta* with pedicellate flowers (Garcia, 1998)

1. Calyx out lobes truncate with or lobes reduce to short points up to 0.5mm (*C. babylonica*).
2. Calyx not truncate with distinct lobes of up to 0.5mm or longer

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Style none or reduced to short conical projections of the ovary (*C. pedicilata*).

Style distinct, slender, flowers tetramerous, corolla lobes cucullate, corolla tube clearly shorter than calyx (*C. rausii*).

Flowers pentamerous, less common tetramerous, corolla lobes not cucullate, corolla tube clearly as long as or longer than calyx, calyx lobes obtuse (*C. riumvirati*).

Calyx lobes acute (*C. epithimum* sub-sp. *corcicana*).

CONCLUSIONS

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 pedicellata* and its host range in Pakistan (Perveen and Qaiser, 2004; Athar *et al.*, 2007; Kanwal *et al.*, 2010). Other workers have also reported *C. abyssinica* (Yuncker, 1932; García and Martín, 2007) from Pakistan which is also not listed in reported species. The presence of *Cuscuta pedicellata* weed is a serious concern for fodder grower and farmers in Pakistan. The resistant varieties of *Trifolium* species should be used in order to combat this serious weed parasite.

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