Int.J.Curr.Microbiol.App.Sci (2019) *8*(4): 1293-1301

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 04 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.804.149

Host Range of *Cuscuta gronovii* in Raigad and Thane Districts in Konkan Region of Maharashtra, India

V.R. Bangar[1*], P. G. Borkar[1] and S.B. Sable[2]

[1]Department of Plant Pathology, College of Agriculture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri- 415 712(M.S.), India
[2]Department of Plant Pathology and Agricultural Microbiology, Post Graduate Institute, MPKV, Rahuri, India

**Corresponding author*

Keywords

Cuscuta gronovii, Pulses, Haustorial development, Cuscutaceae, Convolvulaceae, Fabaceae, Asteraceae, Amaranthaceae, Eriocaulaceae and Verbenaceae

Article Info

Accepted:
10 March 2019
Available Online:
10 April 2019

A B S T R A C T

Present survey was conducted on dodder (*Cuscuta gronovii*) which are occupies in different locations of Raigad and Thane districts of Konkan region of Maharashtra. Dodder (*Cuscuta gronovii*) is complete stem parasite. Pulses are cultivated in Konkan region during Rabi season after harvest of Kharif rice. Cuscuta causes a serious problem in pulses. The surveys were conducted for host range of *Cuscuta gronovii* in different locations of Raigad and Thane districts of Konkan region during 2015-2016. It was observed that 37 angiospermic host plants belonging to 14 families were parasitized by *C. gronovii* and grouped into weed hosts (30 spp.), cultivated pulses (4 spp.), other plants (2 spp.) and ornamental plant (1 spp.). The infection of *C. gronovii* was mostly on weed host and some cultivated pulses. *C. gronovii* was mostly parasitizing different families like Fabaceae, Asteraceae, Amaranthaceae and Verbenaceae. In present investigation this was a new and first report of *Cuscuta gronovii* parasitizing to weed host of family Eriocaulaceae and also first report of all weed hosts parasitized by *C. gronovii* in Konkan region. The present study also revealed that the shape and mode of development of haustoria was variable. Haustoria structure of pulses host was highly developed rod or tube like, dome shaped structure and well established within the host tissue by penetrating epidermis and cortical tissue towards the vascular bundle of pulse host.

Introduction

Cuscuta spp. are parasitic plants of Mediterranean origin. They are worldwide in distribution. In marathi, *Cuscuta* spp. are also known as Akashwel or Amarwel, is a parasitic angiosperm belonging to the family Convolvulaceae in older references and *Cuscuta*ceae in the more recent publications. Weber (1986) divided the family *Cuscuta*ceae into two genera i.e. *Cuscuta* and Grammica, based on the shape of the stigma. The genus *Cuscuta* is comprised of about 175 species worldwide. The wide geographical distribution of dodder species, their wide host range and the difficulties associated with their control, place them among the most damaging parasites worldwide (Dawson *et al.*, 1994 and

Holm *et al.,* 1997). *Cuscuta* are broadly nonspecific, attacks a wide range of plant species including many cultivated plants and dicotyledonous weeds, but rarely the monocotyledonous plants (Wright *et al.,* 2011 and Dawson *et al.,* 1994). Pulses are cultivated in Konkan region during Rabi season after harvest of Kharif rice. There are many reasons for low production of pulses. Out of them phanerogamic plant parasite i.e. *Cuscuta* infection is major problem.

Cuscuta gronovii infesting cranberry fields in Wisconsin reduced the yield by at least 50% (Bewick *et al.,* 1988). Out of these 12 species are reported from India (Gaur, 1999) of which *C. campestris* and *C. reflexa* are most common. In some Indian literature, *C. chinensis* and *C. trifolii* were also reported. Some *Cuscuta* spp. have important medicinal, pharmacological, industrial and edible values, while others are a threat to the natural ecosystems and agricultural crops (Jayasinghe *et al.,* 2004 and Pandey *et al.,* 2013).

In India, *Cuscuta* spp. causes a serious problem in oilseeds like niger (*Guizotia abyssinica* L.), linseed (*Linum usitatissimum* L.) and pulses like black gram (*Vigna mungo* L.), green gram (*Vigna radiata* L.), lentil (*Lens culinaris* L.), chickpea (*Cicer arietinum* L.), especially in rice-fallows and fodder crops like lucerne (*Medicago sativa* L.), berseem (*Trifolium* spp.) in the states of Andhra Pradesh, Chhattisgarh, Gujarat, Orissa, West Bengal and parts of Madhya Pradesh under rainfed as well as irrigated conditions. It reproduces mainly by seeds. The yield reductions due to *Cuscuta* are reported to the tune of 60 to 87 per cent in different crops.

In Konkan region of Maharashtra, the *Cuscuta gronovii* was found to be parasitic on crops of *Rabi* season. In Raigad and Thane districts, it is serious problem on pulses like beans, green gram, kidney bean, cow pea etc. (especially in rice-fallows) in *Rabi* season. It is also parasitic on the other dicotyledonous crops and weeds. Its parasitic effects reduce the plant vigour and yield. In severe infestation the infested plants may die. (Dalvi *et al.,* 2014) Considering importance of the host plants and parasite, present study on *Cuscuta gronovii* parasitic on pulses was conducted to know the host range of *Cuscuta* in Konkan region and its survival.

Materials and Methods

Survey for host Range of *Cuscuta gronovii* in Raigad and Thane districts of Konkan region

For recording the host range of dodder (*C. gronovii*) in Konkan region, in general and around the pulse fields, particularly in rice fallows, along the roadsides and railway track sides etc. dodder spp. were critically observed by undertaking the roving survey. The survey was conducted in the month of September-October, 2015 (Kharif) and in the month of January, 2016 (Rabi) in different locations *viz*., Alibag, Karjat, Khalapur, Mahad, Mangaon, Mhasla, Pen, Poladpur, Roha, Tala Tahsils of Raigad district and Badalpur, Murbad, Shahapur, Ulhasnagar Tahsils of Thane district of Konkan region of Maharashtra. The survey was completed in two rounds by visiting the above places.

The survey was done by just observing the infestation of *C. gronovii*, if any, on all types of cultivated pulse crop fields, weeds, wild plants and shrubs. The plants parasitized by *Cuscuta* were visually observed for the attachment of vegetative parts of *Cuscuta* to the host plant. Cultivated pulse host plants were identified basis of haustorial structure and establishment within a host. Samples of cultivated pulse plants parasitized by *C. gronovii* were collected in paper bags during

survey and brought to the laboratory. It was carried out by made a very thin transverse or cross sections of host parasite attachment zone. This section was placed on glass slide and observed under compound microscope at 10X.

Results and Discussion

Survey for host range of *C. gronovii*

Surveys for the host range of *C. gronovii* were conducted during the year 2015-16 in different locations of Raigad and Thane Districts of Konkan region of Maharashtra. The data presented in Table 1 revealed the 37 angiospermic host plants belonging to 14 families were parasitized by C. gronovii and grouped into weed hosts (30 spp.), cultivated pulses (4 spp.), other plants (2 spp.) and ornamental plant (1 spp.). (PLATE I).

Results of survey revealed that parasitism of *C. gronovii* was mostly on weed hosts, some cultivated pulses and other plants. These results indicate the predominance of *C. gronovii* mostly on dicotyledonous annual as well as perennial host plants and rarely parasitized monocotyledonous plant. *C. gronovii* was predominantly parasitizing on the families viz., Asteraceae and Fabaceae each containing 9 species followed by Amaranthaceae (4 spp.), Verbenaceae (3 spp.), Convolvulaceae and Malvaceae (2 spp.) each.

Remaining 8 families *viz*., Asclepiadaceae, Boraginaceae, Cyperaceae, Eriocaulaceae, Moraceae, Onagraceae, Poaceae and Rhamnaceae had 1 species each parasitized by *C. gronovii*.

Haustoria structure of pulse host plants was observed. Haustoria was highly developed such as rod or tube like, dome shaped structure and well established within the host tissue by penetrating epidermis and cortical tissue towards the vascular bundle of pulse host (PLATE II).

Present survey also indicated that *C. gronovii* prefers dicotyledonous plants than the monocotyledonous plants. Few monocotyledonous plants *viz*., *Eriocaulon sieboldianum*, *Paspalum disticum* and *Cyperus difformis* were parasitized by *C. gronovii.*

Distribution of *C. gronovii* was mainly found near the abandoned areas, besides the railway lines (Konkan railway), road side vegetation, herbaceous plants near shallow ditches, in rice fallows lands and in pulses fields as well as around the pulses fields i.e. on weeds and trees on bunds (Plate III). Results of present study are in the conformity with earlier findings of Dawson *et al.*, (1994) and Holm *et al.*, (1997).

The above findings are in closed conformity with the results of Dalvi *et al.*, (2014) who carried out the survey for host range of dodder (*C. gronovii*) during the year 2012-13 in different localities of Raigad district of Konkan region of Maharashtra and reported that cultivated pulses such as green gram (*Vigna radiata* L.), black gram (*Vigna mungo* L.) and chickpea (*Cicer arietinum* L.) were parasitized by *C. gronovii* in Rabi season.

They also observed that some of the dicotyledonous perennial plants and weeds were parasitized by *Cuscuta*. Vyas and joshi, 1975 reported that a new record of parasitic dodder on chickpea (*Cicer arietinum* L.).

Kumar and Kondap, (1992) also reported that the cultivars of green gram and black gram parasitized by *Cuscuta* spp. Moorthy, *et al.*, (2003) reported that some field crops infested by parasitic *Cuscuta* spp. Mishra, (2009) also found that pulses plants infested by *Cuscuta* sp.

Table.1 Host range of *C. gronovii* from Raigad and Thane districts of Konkan region in Maharashtra

Sr. No.	Botanical name of host plants	Family
A. Weeds:		
1	*Abelmoschus moschatus* Medik.	Malvaceae
2	*Abutilon indicum* (L.) Sweet.	Malvaceae
3	*Achyranthus aspera* L.	Amaranthaceae
4	*Aeschynomene indica* L.	Fabaceae
5	*Ageratum conyzoides* L.	Asteraceae
6	*Alternanthera philoxeroides* (Mart.) Griceb.	Amaranthaceae
7	*Alternanthera sessilis* (L.) DC.	Amaranthaceae
8	*Alysicarpus rugosus* (Willd.)	Fabaceae
9	*Amaranthus spinosus* L.	Amaranthaceae
10	*Atylosia scarabaeoides* L.	Fabaceae
11	*Caesulia axillaris* Roxb.	Asteraceae
12	*Calotropis gigantea* L.	Asclepiadaceae
13	*Cassia tora* L.	Fabaceae
14	*Celosia argentia* L.	Amaranthaceae
15	*Chromolaena odorata* L.	Asteraceae
16	*Cyperus difformis* L.	Cyperaceae
17	*Cythocline purpurea* L.	Asteraceae
18	*Eclipta alba* L.	Asteraceae
19	*Eriocaulon sieboldianum* L.	Eriocaulaceae
20	*Heliotropium indicum* L.	Boraginaceae
21	*Ipomea aquatica* Forssk.	Convolvulaceae
22	*Ipomea pes-trigridis* L.	Convolvulaceae
23	*Lactuca* spp.	Asteraceae
24	*Lantana camara* L.	Verbenaceae
25	*Ludwigia octovalvis* (Jacq.) Raven.	Onagraceae
26	*Paspalum disticum* L.	Poaceae
27	*Sphaeranthus indicus* L.	Asteraceae
28	*Vicoa indica* L.	Asteraceae
29	*Vigna sublobata* L.	Fabaceae
30	*Vitex nigundo* L.	Verbenaceae
B. Cultivated pulses:		
1	*Cicer arietinum* L.	Fabaceae
2	*Lablab purpureus* L.	Fabaceae
3	*Vigna mungo* L.	Fabaceae
4	*Vigna radiata* L.	Fabaceae
C. Other plants (Trees):		
1	*Ficus glomerata* Roxb.	Moraceae
2	*Zizyphus jujuba* Lam.	Rhamnaceae
D. Ornamental plant:		
1	*Duranta repens* L.	Verbenaceae

Plate.1 Host plants parasitized by *C. gronovii* recorded during survey

Abelmoschus moschatus Medik

Abutilon indicum (L.) Sweet.

Achyranthus aspera L.

Aeschynomene indica L.

Ageratum conyzoides L.

Alternanthera philoxeroides (Mart.) Griceb.

Alternanthera sessilis (L.) DC.

Alysicarpus rugosus (Willd.)

Amaranthus spinosus L.

Atylosia scarabaeoides L.

Caesulia axillaris Roxb.

Calotropis gigantea L.

Cassia tora L.

Celosia argentia L.

Chromolaena odorata L.

Cyperus difformis L.

Cythocline purpurea L.

Eclipta alba L.

Heliotropium indicum L.

Ipomea aquatica Forssk.

Ipomea pes-trigridis L.

Lactuca spp.

Ludwigia octovalvis (Jacq.) Raven.

Paspalum disticum L.

Sphaeranthus indicus L.

Vicoa indica L.

Vigna sublobata L.

Vitex nigundo L.

Cicer arietinum L.

Vigna mungo L.

Vigna radiata L.

Lablab purpureus L.

Ficus glomerata Roxb.

Zizyphus jujuba Lam.

Duranta repens L.

PLATE II: Haustoria of *C. gronovii* parasitized on pulses cross/transverse section of host-parasite attachment zone

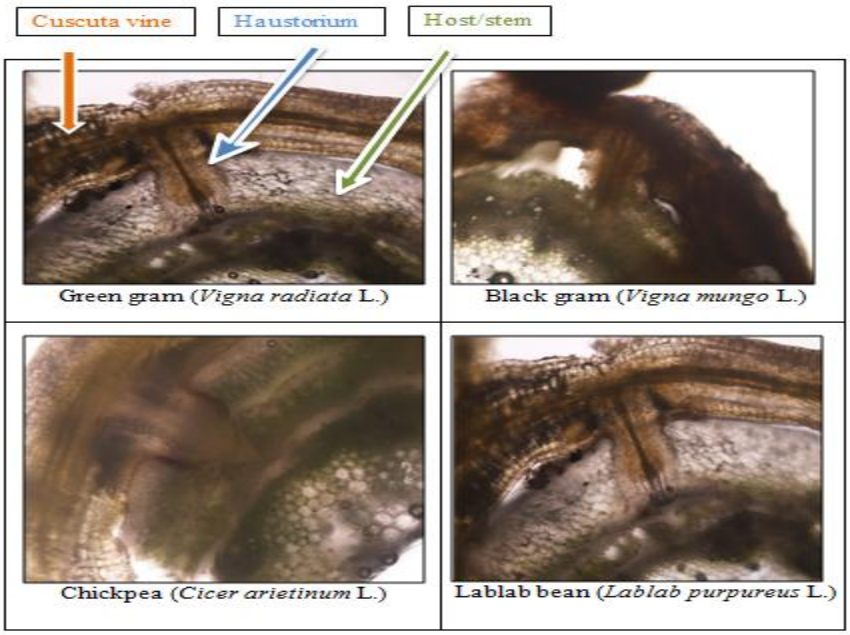

PLATE III: Areas/fields severely parasitized by *C. gronovii*:

In earlier studies it has already indicated the host parasite relationship of *Cuscuta*. Bhattarai *et al.*, (1989) carried out survey of *C. reflexa* and found that 39 plant species, representing 28 families, were reported as being either primary (13 species) or secondary hosts (26 species). *Duranta repens* was found the most susceptible host plant of *C. reflexa*. Kapoor and Sharma (2007) found that prevalence of *C. campestris* was observed mostly on wild hosts and only a few cultivated ornamental plant like *Duranta*

repens belongs to family Verbenaceae. Also grass i.e. monocotyledonous plant (unidentified) infested by *C. campestris* belongs to families Asteraceae and Poaceae, respectively.

The findings of present investigation are also in accordance with Sarma *et al.,* (2008) who found that attack of *C. reflexa* Roxb was more on Verbenaceae family and reported that infestation of *C. reflexa* Roxb on both *Lantana camara* L. and *Vitex negundo* L. and *Ziziphus mauritiana* Lamk belonging to families like Verbenaceae and Rhamnaceae, respectively. Kanade *et al.*, (2009) who observed the host plants such as *Alternanthera triandra* and *Amranthus viridis* belongs to Amaranthaceae family, *Lantana camara* (Verbenaceae), *Ipomea* sp. (Convolvulaceae), *Calotropis gigantea* L. (Asclepiadaceae), *Cassia* sp. (Fabaceae), *Ficus glomerata* Roxb. (Moraceae), *Vitex negundo* Linn. (Verbenaceae) and *Zizyphus jujube*. There was new report of family Eriocaulaceae plant infected by *C. gronovii*.

In conclusion, prevalence of *C. gronovii* mostly on weed host, some cultivated pulses, dicotyledonous annual as well as perennial host plants and rarely on monocotyledonous plants. C. gronovii was mostly parasitizing different families like Fabaceae, Asteraceae, Amaranthaceae and Verbenaceae. In present investigation this was a new and first report of *Cuscuta gronovii* parasitizing to weed host of family Eriocaulaceae and also first report of all weed hosts parasitized by *C. gronovii* in Konkan region.

References

Bewick, T. A., Binning, L. K. and Dana, M. N., 1988. Post attachment control of swamp dodder (*Cuscuta gronovii*) in cranberry (*Vaccinium macrocarpon*) and carrot (*Daucus carota*). *Weed Technology*., 2: 166–169.

Bhattarai, T., Bhandary, H. and Shrestha, P., 1989. Host range of *Cuscuta reflexa* Roxb. in the Kathmandu Valley, Nepal. *Plant Protection Quarterly*., 4 (2): 78-80.

Dalvi, M. B., Joshi, M. S. and Chavan, L. S., 2014. Control of Dodder Parsitic on Pulses. Associate Director of Research, Regional Agril. Research Centre, Karjat, Dist. Raigad. Project Report Submitted to Project Director, ATMA, Alibag, Raigad.

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

Holm, L., Doll, J., Holm, E., Pancho, J. and Harbinger, J., 1997. World Weeds: Natural Histories and Distribution. John Wiley & Sons, NY, USA.

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

Kanade, M. B., Gham S. K. and Patil N. A., 2009. Host Range of Genus *Cuscuta* in Solapur District of Maharashtra. *Bioinfolet*., 6 (2): 146-148.

Kapoor, V. and Sharma Y. P., 2007. Host Range, Severity and Intensity of *Cuscuta campestris* Yuncker Infestations in Jammu Province of Jammu and Kashmir. *Indian J. Weed Sci*., 39 (1 & 2): 146-148.

Kumar, R. M. and Kondap, S. M., 1992. Response of greengram and blackgram cultivars to *Cuscuta* infestation. *Ind. J. Plant Protec.*, 21: 167-171.

Mishra, J. S., 2009. Biology and Management of *Cuscuta* spp. *Indian J. Weed Sci*., 41 (1 & 2): 1-11

Moorthy, B. T. S., Mishra, J. S. and Dubey,

R. P., 2003. Certain investigations on the parasitic weed *Cuscuta* in field crops. *Ind. J. Weed Sci*., 35: 214-216.

Pandey, P. K., Singh, A. K., Singh, S., Pandey, V. and Singh, M. C., 2013. *Cuscuta*: A Freeloading Weed, their Dilemma and Property. *International Journal of Agriculture, Environment & Biotechnology*. 6 (3): 479-486.

Sarma, H., Sarma, C. M. and Bhattacharjya, D. K., 2008. Host Specificity of *Cuscuta reflexa* Roxb. in the Manas Biosphere Reserve, Indo-Burma Hotspot. *International Journal of Plant Production*., 2 (2): 175-180.

Vyas, S. C. and Joshi, L. K., 1975. A new record of parasitic dodder on chickpea (*Cicer arietinum* L.). *Current Science*., 44: 701-702.

Weber, W. A., 1986. Colorado Flora: Western Slope. Colorado Associated University Press, Boulder.

Wright, M. A. R., Welsh, M. and Costea, M., 2011. Diversity and evolution of the gynoecium in *Cuscuta* (Convolvulaceae) in relation to their reproductive biology: two styles are better than one. *Plant System and Environment*., 296: 51–76.

How to cite this article:

Bangar, V.R., P. G. Borkar and Sable, S.B. 2019. Host Range of *Cuscuta gronovii* in Raigad and Thane Districts in Konkan Region of Maharashtra, India. *Int.J.Curr.Microbiol.App.Sci.* 8(04): 1293-1301. doi: https://doi.org/10.20546/ijcmas.2019.804.149