Host Diversity of Cuscuta Reflexa Roxb. In Darjeeling District, West Bengal, India

Dr. Debabrata Das
Dept of Botany
Government General Degree College Lalgarh, Jhargram, W.B., India

Abstract- *The paper represents host range diversity of Dodder (Cuscuta reflexa Roxb.) in Darjeeling District of West Bengal. It reflects 12 genera and 12 species under 12 families of angiosperms which have potential susceptible towards the infection infected by parasitic host dodder. It also shows the percentage of infection against all studied along with distribution nearer to foothills of Darjeeling Himalaya, particularly nearer to Sikkim and Nepal Himalaya. Available data revealed that some hosts are primary hosts and others are secondary hosts of Cuscuta reflexa but the mode of the infection is more or less same. Ziziphus mauritiana (30.46%) showed highest infection and Argyreia argentea (0.78) showed lowest infectivity by Cuscuta reflexa. Here, Ziziphus mauritiana is abundant whereas others are less to least abundant species.*

Keywords- Dodder-Darjeeling district-host phytodiversity of Cuscuta-management.

I. INTRODUCTION

The genus *cuscuta* (Tourn) L. contains large number of species over the globe[1]. This is world wide in distribution and consists of three major sub genera-*Monogyna, Cuscuta, and Gramica* (Monostyleae, Homostyleae, and Heterostyleae). Tournefort[2] first introduced the genus *Cuscuta* in science but mentioned no species under the genus. Linneaus [3] described two species under the genus *Cuscuta* in the science. After describing these, he gave a clear delimitation of these species of the same genus. *Cuscuta europae* L. was taken to represent the type species. About 170 species of this genus occur globally but Munz listed 16 in California [4]. The genus *Cuscuta*, commonly called 'dodder' of the family Cuscutaceae[5], formally Convolvulaceae which is a leaf-less twining herb, yellow, total-parasitic. It spread over more than 100 species distributed in the tropical and temperate region of the world. *Cuscuta* is regarded as having medicinal properties; such as seeds are carminative, anodyne and purgative. Prain[6] has reported only one species *i.e Cuscuta reflexa* Roxb. from Bengal. After that a few workers worked on host range of *Cuscuta* from West Bengal. Badal *et al.* [7] has been recorded 41 species of host from Birbhum District in West Bengal. Ghosh and Das[8], Das et al. [9], Ghosh and Das [10], and Das et al. [11] have recorded 37, 15, 65 and 32 species of angiosperms as host plants of *Cuscuta reflexa* from the erstwhile Midnapore, Bankura, Howrah and Purulia districts of West Bengal respectively. But the study of host range of the same parasite from some districts of the state like Darjeeling and Jalpaiguri (erstwhile) is left untouched till date. Das and Mishra [12] have recorded 44 species of angiosperm as host plants of the said parasite from the district Burdwan in West Bengal. After that a total of 58 species of host plants of *Cuscuta reflexa* have been recorded from Dooars of North Bengal mainly in the Cooch Behar district by Das *et al.* [20]. It spread over 54 species of dicot plants and 4 monocots belonging to 31 families. Out of 31 families, 28 plants were under dicot families and 3 were under monocot families *i.e* 90.32% of host families are under dicot and 9.6% host families are under monocot type. Considering genus wise it is found that, 58 host species of the plants parasite are restricted to 44 genera of dicots and 4 genera of monocoa aea recort *i.e.* 91.66% dicots and 8.33% monocots.The ecological habitats of the host also varies widely depending upon the types of ecological habitats. They range from hydrophytes two to xerophytes though some are mesophytes. In all, the habitats, host belonging to both monocot and dicots are distributed showing its wide range of affinity throughout the land mass of West Bengal. Ghosh and Das recorded large number of host species from entire Uttar Dinajpore District of North Bengal[21]. Similarly a Study revealed that 58 hosts of dodder is recorded for the district Cooch Behar is 58, as against 52 species, 65 species, 44 species and 37 species recorded for the districts like Uttar Dinajpur District[21], Howrah District, Burdwan District, and erstwhile Midnapore District. During 1998, Das[22] added 35 additional species as hosts of *Cuscuta reflexa* from the same district of Midnapore (35 dicots and 2 monocot species) and thus total recorded hosts come to 72. In the districts Purulia and Bankura, host of the same parasite recorded in there in numbers as 32 and 15 respectively. So, the record of host in Cooch Behar district stand 3rd position *i.e* 58 in numbers among the districts studied. Further one species of monocot *i.e Phoenix sylvestris* has been found to be infested by the dodder in Cooch Behar District. There has been report of attack by dodder on four species of monocot species such as *Canna indica*, *Eichhornia crassipes*, *Monochoria hastata* and *Phoenix sylvestris*. No infestation of the same parasite *Cuscuta*

reflexa on monocot species takes place, such as, *Dioscoria alata* (Dioscoreaceae) has been found till date under cultivation of cultivars over the West Bengal. Not only that the same species and their ecological significance have been study in India and abroad by different workers time to time [13-19]. Himalayan part is not yet been studied well. Upper part in Eastern Himalaya, the varied eco-climate obviously has different form of representation. Therefore, the present study has been conducted to know the distribution pattern of infectivity infested by *Cuscuta reflexa* though other species under the same is untouched. The present information is therefore a record of hosts and the bushy pattern ecologically significant to support other kind of research in the present day context.

II. STUDY AREA

Study area includes the places like a) Darjeeling pool bazar, b) Rangli Rangliot, c) Kalimpong-I, d) Kalimpong-II, e) Gorubathan, f) Jore Bunglow, g) Sukia Pokheri, h) Kurseong, i) Matigara, j) Naxalbari, k) Phansidewa, l) kharibari, and m) Mirik. All the study sites were placed under the district Darjeeling which falls 88^0 53´ E to 87^0 59´ E and 27^0 13´ N to 26^0 27´ N.

III. MATERIALS AND METHODS

Plant materials were collected from different places since June 2012 along with the sites of Terai area of Nepal (Kakrabhita and Dhulabari areas of Nepal). During collection all specimens were properly tagged and demarcated with collection number with date to identify the selected host of dodder (*C. reflexa*) or not along with the collection time and habitat. For detailed study sections of the stem along with the haustorial penetration sites were tested under compound microscope. During examination in laboratory, intensity of infection on primary and or secondary hosts were identified along with the intensity of infectivity was studied. Populations of host plants were also studied to know the ecological status of hosts in field. Normally three kinds of status have been made after critical field study and laboratory examination. These are abundant (more than 80% frequency), less abundant (less than 80% but more than 10%) and least abundant (less than 10%) host species. The number of infected plants studied in each site was determined in a quadrat size 1m x 1m for herbs or under-shrubs, 5m x 5m for shrubs and 10 m x 10 m for tree species. Study sites were divided into some microclimate namely shrubberies, fallow land trees, garden (Tea and Orange), home or kitchen garden, living fences, agricultural field, horticultural field and forests including degraded land vegetation or river bank vegetation. For each site, seasonal studies were made following botanical data collection standard. Some interesting photographs were also taken for ecological study and demarcation of species including other purpose. For detailed study, 3 sites namely Naxalbari and Phansidewa along with Matigara were demarcated. Phenology and infection intensity were monitored in a regular basis to know the variations among the co-variants of the same species.

IV. RESULTS AND DISCUSSION

Results revealed that it is similar to the pattern of infectivity which is positively correlated with hosts. The literature result of Kathmandu valley also showed similarity in which total species recorded was 39 as hosts of *Cuscuta reflexa* under 39 families. Among the host plants studied, 13 species were identified as primary hosts of dodder while 26 plant species were secondary hosts for the same plant parasite. A positive correlation existed between the intensity of infestation, status of the hosts (Primary and secondary) and haustorial development. My result revealed 12 species under 12 varied genera and 12 families (Table 1). No monoct have been found as host of Cuscuta though the Nepal study revelaed 2 monoct grass species. Study also revealed that the said plant is medicinal followed by available literature [14-16]. Here, *Ziziphus mauritiana* (30.46%) showed highest infection followed by *Mikania micrantha* (26.17%) and *Argyreia argentea* (0.78) showed lowest infectivity by *Cuscuta reflexa* (Fig. 1). Exotic weed *Parthenium hysterophorus* showed 4.2% infectivity which is a new record for the district (Table 1). *Lantana camara* of lower altitude showed infectivity where as higher showed no infection by the same parasite. It is also important because only one species i.e. *Ziziphus mauritiana* is abundant while 2 species are least abundant (Table 2). Nine species are less abundant. So, high infectivity is negligible which is common in lower altitude available in other districts of West Bengal so far studied.

Table 1. Diverse host species of *Cuscuta reflexa* in Darjeeling District in West Bengal

Sl. No.	Name the host species	Family	Infection patch	% of infection (Bush wise)
1.	*Acacia nilotica*	Mimosaceae	43	16.79
2.	*Argyreia argentea*	Convolvulaceae	2	0.78
3.	*Bougainvellia spectabilis*	Nyctaginaceae	3	1.17
4.	*Clerodendrum viscosum*	Verbenaceae	8	3.12
5.	*Jatropha curcas*	Euphorbiaceae	4	1.56
6.	*Lantana camara*	Verbenaceae	27	10.54
7.	*Mikania micrantha*	Asteraceae	67	26.17
8.	*Parthenium hysterophorus*	Asteraceae	11	4.2
9.	*Ricinus comunis*	Euphorbiaceae	4	1.56
10.	*Syzygium cumuni*	Myrtaceae	3	1.17
11.	*Vitex negundo*	Verbenaceae	6	2.34
12.	*Ziziphus mauritiana*	Rhamnaceae	78	30.46
			256	99.86

Table 2. Status of hosts in connection with infection infected by *C.reflexa* in Darjeeling Dist.

Sl. No.	Name the host species	Family	Frequency	Eco-status
1.	*Acacia nilotica*	Mimosaceae	30	Less Abundant
2.	*Argyreia argentea*	Convolvulaceae	5	Least Abundant
3.	*Bougainvellia spectabilis*	Nyctaginaceae	5	Least Abundant
4.	*Clerodendrum viscosum*	Verbenaceae	10	Less Abundant
5.	*Jatropha curcas*	Euphorbiaceae	20	Less Abundant
6.	*Lantana camara*	Verbenaceae	30	Less Abundant
7.	*Mikania micrantha*	Asteraceae	70	Less Abundant
8.	*Parthenium hysterophorus*	Asteraceae	20	Less Abundant
9.	*Ricinus comunis*	Euphorbiaceae	10	Less Abundant
10.	*Syzygium cumuni*	Myrtaceae	10	Less Abundant
11.	*Vitex negundo*	Verbenaceae	40	Less Abundant
12.	*Ziziphus mauritiana*	Rhamnaceae	80	Abundant

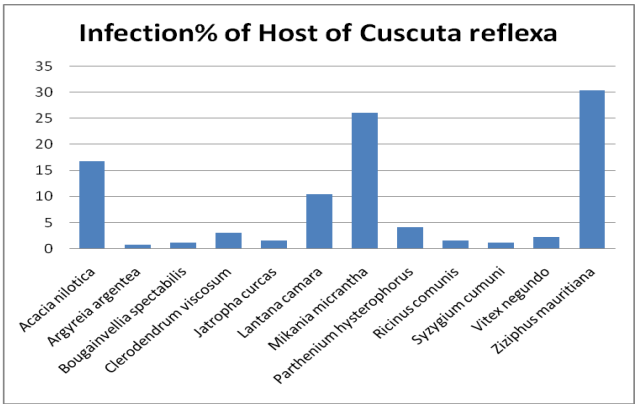

Fig. 1 Infection of host species of *Cuscuta reflexa* tudied in Darjeeling District, W.B.

V. CONCLUSION

Present study includes the host range in Darjeeling along with ecological status of the plants but not medicinal value though it has been used as potent medicinal plants. In West Bengal, Ghosh reported the same as medicinal one from Rarh area of West Bengal, that the stem, juice of the dodder if feed to the cows thrice daily can cure the diarrheal disease (Ghosh, 2008). The plant stem and seeds have highly important medicinal value (Vijikuar *et al*., 2011). The plant is used as antifertility agent. Some areas of Southwest Bengal, people of ethnic area used the plant sap as the shampoo of hairs even to strengthen the hairs from the infancy. But due to lack of printed publications the knowledge is confusion under different levels. People of some urban areas of Jharkhand nearer to Jhargram district of W. Bengal and Balasore district of Odisha very close to Purba Medinipur used the dodder plants as polishing agent and ash as tooth powder. But, most of the plants are mixed with other species like *Cuscuta mongyna* which having special attraction because the plant is used against amoebic dysentery even in blood dysentery. The first one has globose stigma found in flower and the second one having bifid stigma if tested under laboratory condition. More research on total hosts species should be included to make a comprehensive report as the Darjeeling is entirely under Eastern Himalaya that has very dangerous slopes in the entire geographical locations. More and more research projects may be included to study intensively in all parts of all blocks through rigorous study.

VI. ACKNOWLEDGEMENTS

Author is grateful to the higher authority of Department of Higher Education, Science & Technology and Biotechnology, Govt. of West Bengal due to transfer him from Jhargram Raj College to Darjeeling Govt. College (2012-2016) which enable him to work in North Bengal Zone while he is an inhabitant of south West Bengal of West Bengal. He acknowledges Sri S. K. Mollay, DFO, Silviculture Hills Division (Darjeeling) for cordial help during survey in field. He is also thankful to some students of P.G. Department of Botany, Darjeeling Govt. College, Darjeeling, W.B. Officer-in-Charge, Darjeeling Govt. College, Darjeeling is also acknowledged.

REFERENCES

[1] Willis, J.C. 1973. A Dictionary of the flowering plants and ferns, 8th Edition, London.

[2] deTournefort, J.P. 1700. Institutiones Rei Herbariae, 1:652, t.422. Paris

[3] Anonymous. 2003. Linneaus' Philosophia Botanica, translated by Stephen Freer, Oxford University Press, Reprint, 2013, UK.

[4] Anonymous. 1980. *Cuscuta* spp. (Dodder): A literature review of its Biology and Control, Division of Agricultural Sciences, University of California, 1976. Pp, 24.

[5] Das, D. 2007. Host range diversity of *Cuscuta reflexa* Roxb. in South 24-Parganas District of Wet Bengal, *Environment & Ecology*, 25(1): 106-108.

[6] Prain, D.1903. Bengal Plants, Vol-I & II, BSI, Calcutta, India (Revised in 1963).

[7] Datta, B.K. 1993. Host range of *Cuscuta reflexa* Roxb. in Birbhum District, *Environment & Ecology*, **11**: 701-702.

[8] Ghosh, R.B. and Das, D. 1996. A Preliminary census and taxonomic study of host-plants of *Cuscuta reflexa* Roxb. in Midnapore District, West Bengal, *Indian Jour. App. & Pure Biol*., **11**:31-33.

[9] Das, D and Ghosh, R.B.; Dutta, A and Maji, U. K. 1999. A Census on the host of *Cuscuta reflexa* Roxb. Range in the district of lateritic Bankura, West Bengal, *Environment & Ecology*, **17**: 763-764.

[10] Ghosh, R.B and Das, D. 1999. A Preliminary census and taxonomic survey of host-plants of *Cuscuta reflexa* Roxb. in Howrah District, West Bengal, India, *Indian Jour. App. & Pure Biol*., **14**:114-117.

[11] Das, D; Hazra, R; Dutta, A and Maji, U. K. 1998. Systematic enumeration and taxonomic survey of *Cuscuta reflexa* Rob. Range in Purulia district, *Environment & Ecology*, **17**: 479-480.

[12] Das, D and Mishra, T. K. 2004. Host range diversity of *Cuscuta reflexa* Roxb. in Burdwan District of West Bengal, *Jour. Econ & Taxon. Bot*., **28**: 922-926.

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

[14] Ghosh, A. 2008. Ethnomedicinal Plants used in West Rarh Region of West Bengal, *Nat. Product Radiance,* **7**(5): 461-465.

[15] Vijikumar, S; Ramanachan, K and Parimala Das, B. 2011. A wounderful Miracle Plant in Ethnomedicine, *Indian Jour. Nat. Sc*., **2**: 676-683.

[16] Nikam, S.S; Santosh, B. Pawar and Kanade, M. B. 2014. Study of *Cuscuta reflexa* Roxb. with special reference to host diversity, anatomy and biochemistry, *Central Euroean Journal of Experimental Biology*, **3**(2): 6-12.

[17] Kanade, M. B. And Gham, S.K. 2010. *Geobios*, **37**(4): 341-342.

[18] Saini, P; Mithal, R; and Menghani, E. 2015. A Parasitic medicinal plant *Cuscuta reflexa*: An Overview, *Int. J. Scientific and Engineering Research*, **6**(12): 951-958.

[19] Sarma, H; Sarma, C.M and Bhattacharjya, D.K. 2008. Host specificity of *Cuscuta reflexa* Roxb. in the Manas Biosphere Reserve, Indo-Burma Hotspot, *Int. Jour of Plant Production*, **2**(2): 175-180

[20] Ghosh, P; Das, D and Das, M. 2011. Phytodiversity of parasitic plant *Cuscuta reflexa* Roxb. in Cooch Behar West Bengal, *Environment & Ecology*, **29**(2): 588-591.

[21] Ghosh, P and Das, D. 2004. A Preliminary census and taxonomic survey of host-plants of *Cuscuta reflexa* Roxb. in Uttar Dinajpore District, West Bengal, *Environment & Ecology*, **22**(S): 459-461.

[22] Das, D. 1998. Additions to the host plants of *Cuscuta reflexa* Roxb. in Midnapore District, West Bengal, *Indian Jour. App. & Pure Biol*., **13**:57-58.