

Host Specificity of *Cuscuta reflexa* Roxb. in the Manas Biosphere Reserve, Indo-Burma Hotspot

H. Sarma^{*}, C.M. Sarma, D.K. Bhattacharjya

Department of Botany, Gauhati University, Guwahati-14, Assam, India.
^{*}Corresponding authors. E-mail: hemens02@yahoo.co.in

Accepted 18 Nov. 2007; Published online 10 Feb. 2008

Abstract

The dodder plant *Cuscuta reflexa* Roxb. is an angiospermic leafless parasitic plant belonging to the family Cuscutaceae is abundantly found colonizing certain plant species in the premises of Manas Biosphere Reserve (MBR) and nearby area. Ten (10) angiospermic host plants in total of the above parasite were recognized. Based on the field inspection most of the numbers of patches were recorded in *Ziziphus mauritiana* Lamk. The host specificity, taxonomy, economic damage and control measure of the parasite have been briefly discussed in this paper.

Keywords: Parasitic Plant; Host Plant; Biosphere Reserve; Buffer Zone; Core Zone

Abbreviations

BSI: Botanical survey of India

FDM: Field Director of Mamas

Introduction

The distinctive ecological taxa, angiospermic parasitic plants are carefully considered as the icon being the influential factor in determining the fate of the quality and quantity of economically valuable timber plant species. They are the serious pest in natural forests, plantation, orchards and ornamental trees in many parts of the world (Calder and Bernhard, 1983). The parasite produces haustorial sinkers, rather than root, which penetrate the branches and stem of the host plants for drawing water and mineral nutrients (Agrios, 2000). A few important contributions on plant parasites have been reported from various parts of India (Fischer, 1926; Srivastava, 2006; Mathur, 1949; Patil, 2001 and Kadavul et al. 2006) but an authentic document fully dealing with the host specificity of *Cuscuta reflexa* Roxb. On the premises of Manas Biosphere Reserve is not available.

Cuscuta reflexa Roxb. Pl.Cor.2:3, t.104.1798; Clarke in FBI 4:223.1883; FL.As.3:362.1938 (Convolvulaceae) is a leafless, twining, parasitic vines; branchlets

yellowish; flower in lateral fascicles or in short raceme; fruit, a subglobose dry or succulent capsule. Seed 2 or 4 glabrous.

Northeast India has been identified as one of the 25 hotspots of biodiversity of the globe (WCMC, 2002). This region of India comprising seven sister states abounds in natural resources including many endemic plants and harbours about 50 per cent (\pm 8500 sp) of the floristic wealth of India (Source: BSI). This area supports the growth of a number of medicinal, aromatic and other valuable plants. Assam, one of the seven states of the North East India is unique in its resources of flora and fauna. Nevertheless, the studies carried out till now are inadequate in view of the vast diversity of host plants of *Cuscuta reflexa* Roxb. and different responses shown by them. The present study was undertaken to contribute taxonomy of the parasite and the host parasite relationship of angiospermic plant in nearby areas of Manas Biosphere reserve, Assam, India.

Study area

Manas Biosphere reserve (MRB), lies in the latitude $91^{\circ}51'$ E to $92^{\circ}0'$ E and longitude $26^{\circ}30'$ N to $27^{\circ}0'$ N. It is bounded by Bhutan in the north and comprises an almost continuously linear belt of land stretching between the Sankhos River in the west and the Dhansiri River in the east. It lies in a belt of forest along the foothills of Himalay to the north of Brahmaputra Valley. The total area of the buffer zone is 2837 sq km of which 500sq km is under core zone. The average mean temperature 37° in summer and 6° in winter (Source: F D M). The climate is moist tropical type and the bountiful monsoon ensures rainfall of approximately 333 cm, particularly May-September period, promoting the revival of flora. *C. reflexa* Roxb. Thrives well during the monsoon, finding the luxuriant growth of the host plants.

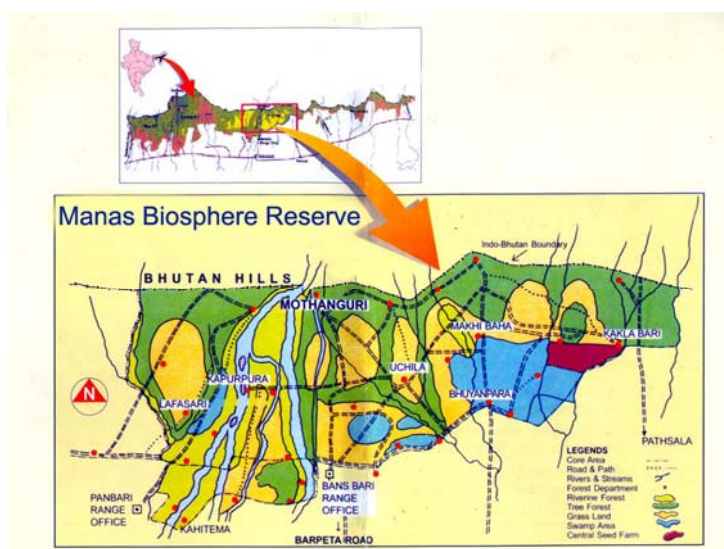


Figure 1. Area surveyed and numbers of host plant of *Cuscuta reflexa* Roxb. recorded. (India: The Manas Biosphere Reserve) [Source: F DM]

Materials and Methods

The diversified host species of *C. reflexa* Roxb were studied in Manas Biosphere Reserve and its fringes. Extensive field survey was undertaken during the month of April - December 2006 at different areas including forest villages and outskirts. The host species were collected for identification and confirmed with the help of existing literature [Hooker (1872-1879), Cooke (1958)] and herbaria available in Botanical Survey of India, Shillong.

Results and Discussion

In the present study *C. reflexa* Roxb. were found on 10 Angiospermic host plants belonging to 10 genera of 7 families (Table 1). Out of 7 families the attack of *C. reflexa* Roxb. was more on verbenaceae affecting 3 (three) species. All the Indian species of *Cuscuta* are described as annuals (Cooke, 1958) like most of the European species. Even though they are attached to perennial woody hosts, they die after flowering.

Predominantly, the attack was severe on the species *Ziziphus mauritiana* Lamk. of Rhamnaceae and the frequency of observed patches was 26.08 per cent. The attack was severe and pulling down the branches of the host wrapped with haustorial sinkers. In the present investigation *C. reflexa* Roxb. was mostly observed along the bushes on the way side of the study area.

The parasites are considered as most important factor affecting the timber value of tree. As such the studies on parasites are being instituted at various parts of the world. In an investigation from Pondicherry in India, Kadavul et al. (2006) reported 8 host species of *Cuscuta reflexa* Roxb. in which 5 species of the present study was not reported. The distribution of the parasite on this host is well thought-out as the supplementary host parasite relationship reported from north eastern part of India. Based on the present investigation it become evident that *Cuscuta reflexa* Roxb. has no host specify and it may even thrive well by absorbing least amount of water and nutrient from the host. It weakens or hinder the normal growth and development of host.

Many studies have already indicated the host parasite relationship of *Cuscuta* (Fer 1976, Nagar and Sanwal 1984, Ihl and Jacob 1990, Shaw and Hennon 1991, Quick 1998). *Cuscuta* contain special glandular cells facilitating adhesion of the parasite to the host (Abubacker et al., 2005). This is the reason why it is found predominantly on the rough bark of *Z. mauritiana* Lamk. These cells divide and spread like a collar around the host plant and then penetrate the phloem (Lee and Lee, 1989). The most favoured host of *C. reflexa* Roxb. is *Z. mauritiana* Lamk. because of its rough bark on which initially the seedlings of the parasite get attached.

Control of *C. reflexa* Roxb. is difficult, because of the parasitic nature. So far the recognized control measure being adopted is manual cutting and burning of parasite after their removal from the host species (Calder and Bernhardt, 1983).



Figure 2. Host plant attacked by *Cuscuta reflexa* Roxb (A) *Ziziphus mauritiana* Lamk., (B) *Jatropha curcas* L., (C) *Mikania micrantha* (L.) Kunth.

Table1. Varied host attacked by *Cuscuta reflexa* Roxb...encountered in Manas Biosphere Reserve.

SL No	Host Plant Species	Family
1	<i>Argyreia argentea</i> var. <i>venusta</i> (Choisy) C. B. Clarke	Convolvulaceae
2	<i>Bougainvillea spectabilis</i> willd	Nyctaginaceae
3	<i>Clerodendrum viscosum</i> Vent.	Verbenaceae
4	<i>Jatropha curcas</i> L.	Euphorbiaceae
5	<i>Lantana Camera</i> L.	Verbenaceae
6	<i>Mikania micrantha</i> (L.) Kunth.	Asteraceae
7.	<i>Ricinus communis</i> L.	Euphorbiaceae
8	<i>Syzygium cumini</i> (L.)Skeels	Myrtaceae
9	<i>Vitex negundo</i> L.	Verbenaceae
10	<i>Ziziphus mauritiana</i> Lamk.	Rhamnaceae

Table 2. The frequency of varied host attacked by *Cuscuta reflexa* Roxb...encountered in Manas Biosphere Reserve, 46 (forty six) Patches observed in total

Host Plants	Patches observed in individual host plant	Frequency of distribution of <i>C. reflexa</i> Roxb in individual host (%)
<i>Argyreia argentea</i> var. <i>venusta</i> (Choisy) C.B. Clarke	1	2.17
<i>Bougainvillea spectabilis</i> willd	1	2.17
<i>Clerodendrum viscosum</i> Vent.	6	13.04
<i>Jatropha curcas</i> L.	7	16.63
<i>Lantana Camera</i> L.	8	17.39
<i>Mikania micrantha</i> (L.) Kunth.	5	6.52
<i>Ricinus communis</i> L.	2	4.34
<i>Syzygium cumini</i> (L.)Skeels	1	2.17
<i>Vitex negundo</i> L.	3	6.52
<i>Ziziphus mauritiana</i> Lamk.	12	26.08

Acknowledgements

Necessary information and facilities provided by the Office of the Field Director, Manas Biosphere reserve are acknowledged.

Reference

- Abubacker, M.N., Prince, M., Hariharan, Y., 2005. Histochemical and biochemical studies of parasite–host interaction of *Cassytha filiformis* Linn. and *Zizyphus jujuba* Lamk. *Curr. Sci.* 89, 2156-2158.
- Agrios, G.N., 2000. *Plant Pathology*. Harcourt Asia Pvt. Ltd, Academic Press, California, USA.
- Calder, M., Bernhard, P., 1983. *The Biology of Mistletoes*. Academic Press, New York.
- Cooke, T., 1958. *Flora of the Presidency of Bombay, Vol.I-VII*. Botanical Survey of India, Calcutta.
- Fer, A., 1976. Photosynthesis and respiration in *Cuscuta lupuliformis* Krock. Seedlings during their preparasitic stage. *Physiol. Veg.* 14, 357-365.
- Fisheer, C.E.C., 1926. Lorantheae of Southern India and their host plant. *Rec. Bot. Surv. India.* 11, 159-195.
- Hooker, J.D., 1897. *Flora of British India, Vol I-VII*. L. Reeve and Co., London.
- Ihl, B., Jacob, F., 1990. Functioning of *Cuscuta* haustoria by benzylaminopurine. *Haustorium.* 24, 4-5.
- Kadavul, K., Pragasam, A., Dixit, A. K., Joseph, Diane R., Prasena, J., 2006. Biodiversity of host species of mistletoes of Pondicherry, Coromondol Cost, South India. *Nat. Env. Poll. Tech.* 5, 309-313.
- Lee, K.B., Lee, C.D., 1989. The structure and development of the haustorium in *Cuscuta australis*. *Can. J. Bot.* 67, 2975-2982.
- Mathur, A.K., 1949. Angiospermic parasite of our forest. *Ind. Forester.* 75, 449-456.

- Nagar, N., Sanwal, G.C., 1984. Biochemical aspects of parasitism in *Cuscuta reflexa*: Inhibition of cell wall degrading enzymes of *Cuscuta* by non-susceptible plants. In: Proceedings of 3rd International Symposium on Parasitic Weeds, Aleppo, CIMMYT.
- Patil, S.H., 2001. Host parasite relationship in tree of Dhule forest. *Geobios*. 28, 33-36.
- Quick, W.P., 1998. Localization of photosynthetic metabolism in the parasitic angiosperm *Cuscuta reflexa*. *Planta*. 205, 506-513.
- Shaw, C.G. and Hennon, P.E.S., 1991. Intensification and upward advance of dwarf mistletoe in thinned, young strands of Western hemlock in Southeast Alaska. *Plant Dis*. 75, 363-367.
- Srivastava, G.D., 2006. Two new hosts of *Loranthus* at Allahabad. *Curr. Sci*. 4, 106-107.
- WCMC, 2002. Global Biodiversity. Chapman and Hall, London.