
Histopathological Studies of *Striga* spp. with Sugarcane roots

AL-MAMUN CHOWDHURY AND ASHEQUE AHMED

Department of Botany, University of Rajshahi
Rajshahi, Bangladesh

Striga densiflora Benth. and *Striga lutea* L. are the phanerogamic semi-root parasitic plants of sugarcane (*Saccharum officinarum* L.). The mode of penetration of haustorium of the parasite into the root tissue of the host was studied. The affected host plant exhibited a gradual stunted growth. The haustorium of the parasite was found within the host tissue.

Key words : Phanerogamic semi-root parasite, *Striga* spp., *Saccharum officinarum*

INTRODUCTION

Striga densiflora Benth. and *Striga lutea* L., members of Scrophulariaceae, as noxious root parasite causing extensive damage to sugarcane crops in Bangladesh, has been reported by Ahmed and Mian (1977), Zuberi and Biswas (1986), and Zuberi *et al.* (1987). Parasitic effects on some crop plants may reduce their yield. Sugarcane (*Saccharum officinarum* L.) is affected by several parasites like other agricultural crops. A semi-parasitic green plant, *Striga* sp., has been reported as a virulent root parasite of sugarcane, which reduces its yield considerably. The affected canes become stunted in growth and size of the internodes are also reduced. The juice content is also reduced considerably by these parasites. In recent years, species of *Striga* have been reported to be lethal pest of sugarcane (Zuberi *et al.*, 1987) in the two northern districts (Rajshahi and Pabna) of Bangladesh. The present work deals with the host pathogen relationship of *Striga* spp. and sugarcane plants.

MATERIALS AND METHODS

In the 2nd week of May, 1987, young *Striga* plants, found at the base of sugarcane roots, were carefully unearthed and brought to the laboratory. The collected

plants were put in big water trays and the muddy materials were washed off carefully. The parasitic plants were found to have a number of root-connection with the host plant. Several such connecting zones from different specimens were selected, labelled and preserved in chemicals. The collected specimens for histological works were fixed in Formalin-Acetic acid-Alcohol (F.A.A.) solution (Johansen, 1940). The materials were dehydrated in ethyl alcohol series, infiltrated in chloroform-alcohol solution and embedded in paraffin wax (60°C, M.P.). Thin sections of 10-12 micron thickness were cut at various angles with a rotary microtome. The sections were affixed to glass slides, stained with Safranin-Orange G-Tanic acid-Iron alum and mounted in Canada Balsam.

RESULTS AND DISCUSSION

During the early days of May, 1987, a large number of very young *Striga* plants began to appear at the base of the host sugarcane plants in the fields. Root system of those parasites are very ill developed. It was also clearly observed that some of their roots have normally spread into the soil, while a few of them were found to be connected with sugarcane roots. But connected zones were very weak and of limited occurrence with the host plant. It was observed that the germinating seeds were associated with the host roots. At first the germinating seeds formed a bulbous structure (Fig. 4) which twin round or engulf the host root completely (Fig. 4). It was noted that the young *Striga* plants established parasitic root-links with host plants (Fig. 4) before emerging from the soil. The seeds, germinated 10-15 cm below the soil and contained 3-4 pairs of immature leaves (Fig 1) before emerging from the soil. After emergence the leaves become green.

At the beginning of infestation there were no significant differences between infested and non-infested cane fields. After a few weeks the infected canes began to show symptoms of reduced growth. The magnitude of stunted growth of the standing canes was high following 4-5 weeks of infestation when each such cane was found to be infested by 40-50 *Striga* plants. The parasites formed a bushy thicket around each host plant (Fig. 2).

The microscopic examination of the internal structure of infected roots revealed that the tip of haustorium of the parasite penetrated through the epiblem and proliferated in the cortex, consisting of hypha like cells (Fig. 4). In the cortex, haustorial hyphae like cells grew independently and spread through the host tissue. It was further observed that a hyphae like cells bridge between the xylem elements of the host and that of the parasite plants appeared (Fig. 4). It was clear from the series of sections that the tips of haustorium reached the lacuna of xylem in the host roots (Fig. 3). It appears that the *Striga*



Photomicrographs showing histo-pathological studies of *Striga* spp. with sugarcane roots

- Fig. 1 Very young *Striga* plant showing young leaves, connecting zone (CZ) and host-root (HR) of sugarcane. (x 60)
- Fig. 2 *Striga* affected sugarcane plants formed a bushy thicket area (0.15).
- Fig. 3 T.S. of connecting zone showing tip of haustorial hyphal cells reached at the lacuna of xylem of host-root (x 60)
- Fig. 4 T.S. of connecting zone showing parasite root (PR), balbous structure (BS) and hyphal cells (HC) of parasite and host-root (HR) of sugarcane (x 60)
- Fig. 5 Photomicrographs showing non-infested (1st) and infected (2nd) sugarcane plants by the *Striga* plants (0.15)

plants derieved their nutrients mostly from xylem of the host. The *Striga* plants bear a number of green leaves (Fig. 2) and photosynthesize their own food from raw materials taken from the host. It is a partial parasitic plant and perhaps prefers absorption of mineral nutrients from the host to prepare its food. The host plant suffered from stunting growth and other ailments due to the depletion of mineral nutrients withdrawn by the parasite. Reduced rate of growth and stunting of the sugarcane plants (Fig. 5) may be caused by any one change in the plant physiological functions like respiration, photosynthesis, translocation and mineral uptake (Wallace, 1973).

A thorough examination revealed that the host-parasitic connections were of limited occurence with weak connecting zones which appeared to be less suitable for extensive withdrawl of nutrients from the host plants. The stunting growth of the host and damage to the crop is to be established by further investigation.

ACKNOWLEDGEMENT

The authors sincerely thank the Chairman, Department of Botany, University of Rajshahi, Rajshahi, Bangladesh, for providing necessary facilities for the work. The authors are also indebted to Prof. M. A. Jabber Miah and Dr. M. Zaman, Department of Botany, University of Rajshahi, Rajshahi, Bangladesh, for their constructive criticism and encouragements.

REFERENCES

- Ahmed, H. U. and Mian, M. I. H. (1977). A note on the occurence of *Striga densiflora* in Bangladesh sugarcane. *Path. Newl.* 18, 10-11.
- Johansen, D. A. (1940). *Plant microtechnique*. McGraw-Hill Book Company. Inc. New York and London.
- Wallace, H. R. (1973). *Nematode Ecology and plant disease*. Edward Arnold London. 228p.
- Zuberi, M. I. and Biswas, A. R. (1986). *Striga densiflora* Benth. a root parasite of sugarcane. *Proc. Bangladesh. Asso. Adv. Seci.* 12th Conf. Sci. 11 : 7p.
- Zuberi, M. I. ; Ahmed, A. ; Biswas, R., Ghosh, G. P., Chowdhury, Al-Mamun, ANM and Roy, P. C. (1987). *Striga densiflora* Benth. an angiospermic root parasite of rice in Bangladesh. *IRRN.* 12(6) : 33.

(Accepted for publication 21st September 1992)