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Mycoplasma Like Organism in Grassy Shoot Disease of Sugarcane

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ABSTRACT

A study was made one the causal organism of grassy shoot disease (GSD) by scanning type of Electron microscope in the Institute of Post Graduate Studies in Agriculture (IPSA), Salna, Gazipur. Samples were taken from leaf, stem and root portion of infected and healthy plants of the variety 'Misrimala'. Large number of spherical, ovoid, ellipsoidal and sometimes irregular shaped Mycoplasma like organism (MLO) ranged from 300 to 900 nm in size was observed in the leaf, stem and root samples of diseased plants. No such MLO was observed in the samples taken from leaf, stem and root of healthy plants.

INTRODUCTION

Grassy shoot disease (GSD) of sugarcane was first reported by Vasudeva (1955) from India. In Bangladesh, external symptoms viz. severe stunting of the plant, excess tillering like grasses, chlorosis of the leaves, and bushy appearance of the disease was first recorded in the variety Co. 1158 (SRTI Annual Report, 1973-78). Now a days, GSD is considered as one of the serious diseases of sugarcane specially in ratoon cane. Badly affected areas are Sreepur (Gazipur), Rajshahi, Jessore, Kushtia and Dinajpur. Sometimes 60-70% clumps of ratoon canes were found to be affected in Sreepur areas in the variety 'Misrimala'. In Bangladesh, about 50% loss in sugar due to white leaf disease (another mycoplasma disease) infection was reported in the variety Isd.2/54 (Hutchinson, 1982). Though the disease causes such a great loss in yield and sugar, but no study has yet been made to know the causal organism of the disease in Bangladesh. Therefore, present study was undertaken to know the causal organism of the grassy shoot disease.

MATERIALS AND METHODS

Healthy and grassy shoot disease infected sugarcane were collected from healthy and badly infected plots of 'Misrimala' variety respectively from Sreepur area in April, 1988. Leaves, stems and roots were taken from both the healthy and infected sugarcanes for the present study, and cut into small pieces (size 0.5× 0.5 cm). A total of 120 pieces from different portions (leaf, stem and root) of the cane were prepared and 40 pieces from each part were treated with 2.48% glutaldehyde solution in buffer (Na_3PO0_40) for two hours, and then washed in buffer solution. The samples were again fixed with osmium tetraoxide (OsO_4) solution for one hour, and then dehydration was made by ethanol series. Gold ion spattering on the samples was done in vacuum gauge and studied using scanning electron microscope at IPSA, Salna, Gazipur.

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RESULTS AND DISCUSSION

The results of the investigation has been shown in the Figures 1, 2 and 3. It is seen in the figures that phloem cells of leaves, stems and roots of infected plants are blocked due to large mumber of spherical, ovoid, ellipsoidal and irregularly shaped mycoplasma like organism (MLO), but healthy leaves, stems and roots were found free from them (not shown in the figure). It was also observed that concentration of MLOs are high in the phloem cells taken from partially dead leaves of the infected plants. Besides, concentration of MLOs were found high towards the periphery than that of the central part of the cells. Near the pore of the cell wall, MLOs are fillamentious in size (Fig. 2) These findings are similar to the report of Rishi, *et al.* (1973). They observed ovoid, spherical, and irregularly shaped mycoplasma like bodies in the sieve tubes of phloem in the grassy shoot disease affected plants. They also found that the concentration of the MLOs was more towards the periphery of the cellwall of the host as compared to that of central part and high concentration of MLOs cause for the mortality of the host cells. They again reported that MLOs move from cell to cell via pores and before entering into the pore they change their shape from spherical/ovoid to filamentous. In the present investigation MLO like irregular bodies ranged from 300 to 900 nm in size (Figs. 1, 2 & 3), while Lin and Lee (1958)

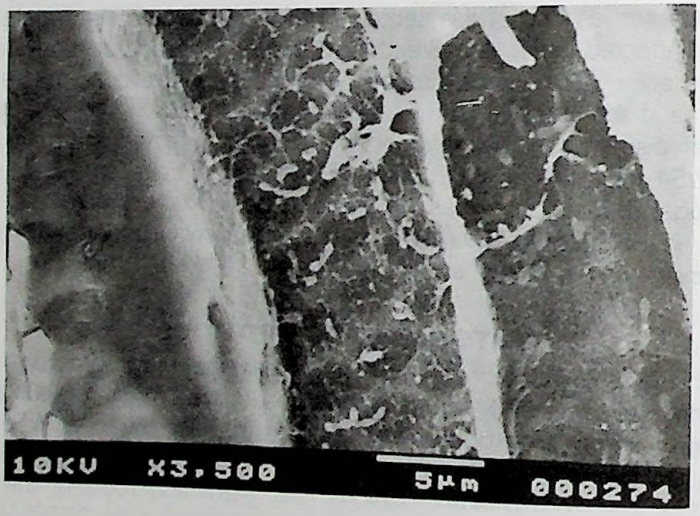

Figure 1. Mycoplasma like bodies in the sieve tube of a phloem cell in a GSD affected sugarcane leaf.

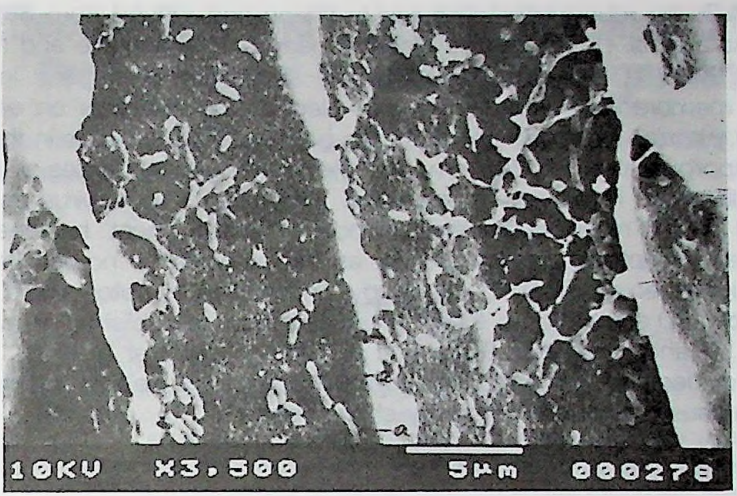

Figure 2. Mycoplasma like bodies in the sieve tube of phloem cell in a GSD affected partially dead leaf (a : Fillamentous bodies near the pore of the cell wall).

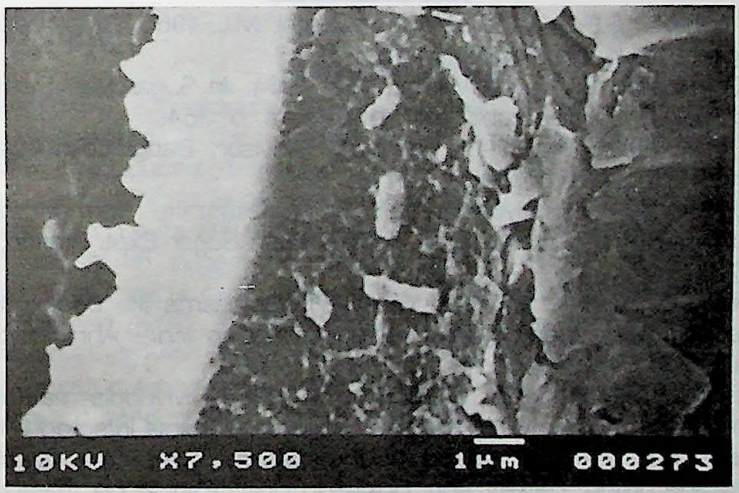

Figure 3. Mycoplasma like bodies in the sieve tube of a phloem cell in GSD affected stem.

reported MLOs as roundish or ellipsoidal in shape and ranged from 80 to 800 nm in size. Shikata *et al.* (1969) studied diseased leaves of sugarcane and recorded 90 to 900 nm MLO in sieve tubes of infected sugarcane plants and individual cell possessed membranes composed of two electron dense layers on either side of dense layer. He also observed characteristic polymorphic structures in the elongated bodies of approximately 60×300 nm, and the smaller dense bodies of 80×200 nm in size in diameter. However, Chona *et al.* (1960) reported a virus as the causal organism of GSD. In recent years, the terminology "Grassy shoot" has been accepted for the patent symptom, profuse tillering, as the authoritative nomenclature for this disease (Hughes *et al*, 1964). In this study, findings on symptoms and pathogenic characters of GSD are similar to those of previous reports published elswehere (Rishi *et al*, 1973; Lin and Lee, 1968; Shikata *et al*, 1969; Hughes *et al*, 1964). Therefore it can be concluded that the MLO like bodies found in the cells of infected plants is possibly the causal organism of grassy shoot disease.

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