

Bacterium Colonies Associated with Ratoon Stunting Disease of Sugarcane

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In Bangladesh ratoon stunting disease (RSD) was identified in 31 out of 51 tested varieties/strains through observing typical symptoms of RSD (Ahmed *et al.* 1979). The disease is considered as major disease of ratoon crop in Bangladesh. The commercial variety Isd-16 showed 53.2% loss in yield due to RSD (Rahman *et al.*, 1986). Although RSD causes a great loss in sugarcane yield, but no investigation has so far been carried out to identify the causal organism of this disease in Bangladesh. Therefore, an investigation was conducted to identify the causal organism of ratoon stunting disease of sugarcane.

Sugarcane variety Misrimala, infected with RSD was used for this study. Several clumps with stunted ratoon canes showing mature node discolouration and healthy canes were collected from Sreepur area. Nodal region of both infected and healthy stalks was cut into small pieces (0.5 X 0.5 cm). A total of 50 pieces (25 healthy + 25 diseased) were treated with 2% glutaraldehyde solution for 2 h and washed in 0.1 M buffer solution. The samples were fixed with Osmium tetroxide (OsO₄) solution for 1h and then dehydration was made by ethanol series. Gold ion sputtering on the sample was done in vacuum gauge and examined under Scanning Electron Microscope (JEOL Scanning) at the Institute of Post Graduate Studies in Agriculture (IPSA), Salna, Gazipur.

It was observed that some xylem vessels of infected plants were completely blocked and some were partially blocked by bacterial colonies (Figure 1). Scattered macro and micro colonies of bacterium were also observed in few xylem matrix (Figure 2). But healthy portions of all xylem vessels were free from them. In the infected xylem matrix, thread like bodies which were straight, curved, comma or club shaped (Coryneform) were observed (Figure 3). The size of the bacterium cells varied from 0.75 to 2.5 micron in length and 0.15 to 0.3 micron in width. According to their size, shape and pleomorphic nature, the bodies recorded closely resembled the coryneform bacterium already reported from other countries (Gillaspie *et al.* 1973; 1976; Teakle *et al.* 1973; Chen *et al.* 1975; Damann and Derrick, 1976; Ricaud *et al.* 1976; Rishi and Nath, 1978; Liu, 1978).

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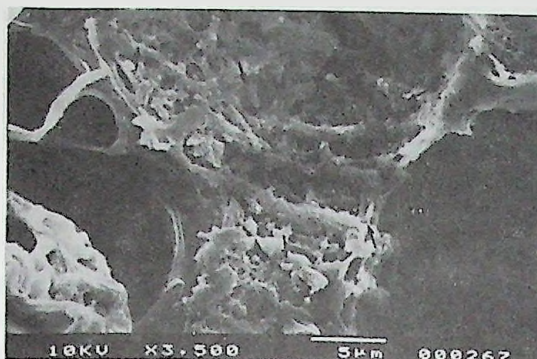


Figure 1. Xylem vessels of infected plants showing complete blocked by RSD bacterium.



Figure 2. Electron micrograph of macro (a) and micro (b) colonies of RSD associated bacterium in the xylem matrix.

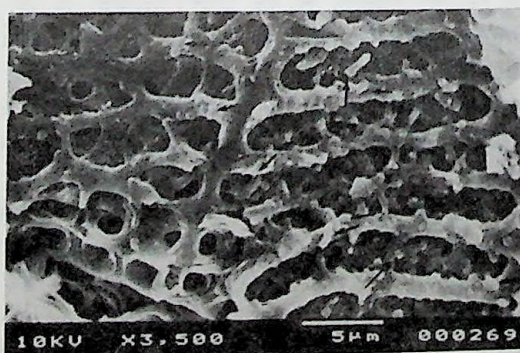


Figure 3. Electron micrographs of RSD associated bacterium in the xylem matrix.

From this study it may be concluded that, the bodies in the xylem matrix of the infected plants in Bangladesh is possibly the causal organism of ratoon stunting disease. Thus we support the hypothesis of the association of a coryneform bacterium with RSD. However, Kao and Damann (1978) and Ricaud and Autrey (1978), reported the existence of micro colonies with branched forms of the organism associated with RSD could be related to the actinomycetes.

Pathogenicity test was done by dipping healthy setts for 10 min in the pure culture of the isolated organism (gram positive bacterium) and in juice extracted from the RSD infected canes (Misrimala). Similar symptoms of RSD were produced and the gram positive bacterium were reisolated from the inoculated plants. The bacterium has been identified as *Clavibacter xyli* sub sp. *xyli* by Davis *et al.* (1984), whereas early researchers presumed a viral etiology of ratoon stunting disease (RSD) of sugarcane.

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