

## BACTERIAL WILT OF TORONTO (C-15) CREEPING BENTGRASS

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Since its selection in the 1930s, Toronto creeping bentgrass (C-15) has been considered an exceptional turfgrass for golf course putting greens. In recent years, a disorder of unknown etiology commonly referred to as the "C-15 problem" or "C-15 decline" has baffled scientists and turfgrass managers alike. In 1979 and 1980, a disease of unknown etiology destroyed the 'Toronto' greens at the Butler National Golf Course in Oak Brook, IL. Individual plants appeared to be wilting from the tip down and were dark green and shriveled. Initially, roots and crown appeared healthy; however, eventually the entire plant became brown and decomposed. Fungi and other disease causing agents commonly associated with turfgrass diseases could not be isolated.

When transmission electron microscopy was used to ascertain the presence of internal agents in May, 1980, many rod-shaped bacteria were observed in the xylem (Fig. 1) from diseased plants. Individual bacteria measured approximately  $0.5 \mu\text{m}$  by  $1-1.5 \mu\text{m}$  and possessed a rippled cell wall (Fig. 2) similar to rickettsia-like bacteria associated with Pierce's disease of grapevines, phony peach disease and other diseases.

Several different bacteria were isolated and tested for pathogenicity on C-15. A frequently isolated bacterium (Fig. 3) produced the characteristic symptoms of the C-15 problem. Scanning electron microscopy confirmed the presence of the bacteria within the xylem of laboratory infected plants (Fig. 4). Because of the symptoms and discovery of bacteria with diseased plants, we elected to name the disease "bacterial wilt" of Toronto creeping bentgrass.

Antibiotic field tests for the control of bacterial wilt were initiated in the Detroit area in early Fall of 1980. Streptomycin and oxytetracycline applied as 600 parts per million (ppm) in 5 gallons of water per 1000  $\text{ft}^2$  were ineffective. Heavy drench applications of 1000 ppm of streptomycin, oxytetracycline, and cupric hydroxide at 50 gallons per 1000  $\text{ft}^2$  were made in Detroit (Edgewood) and Chicago (Village Links) locations in early April 1981. Oxytetracycline was observed to give effective control whereas streptomycin and cupric hydroxide did not inhibit disease progression. In cooperation with Peter Leuzinger, St. Charles Country Club, St. Charles, IL., drench applications of 50 gallons per 1000  $\text{ft}^2$  of 1000 and 1500 ppm oxytetracycline provided absolute control of bacterial wilt (Fig. 5). Scanning electron micrographs of treated (Fig. 6) and nontreated plants (Fig. 7) revealed the prevention of infection in oxytetracycline treated plants.

The discovery of bacteria, the infection by an isolated bacterium and the subsequent management by oxytetracycline proves that the C-15 problem is a bacterial disease. Research on bacterial wilt, the first bacterial disease of a cultivated turfgrass spp., will provide a research basis for combating new or existing bacterial diseases on other turfgrasses.

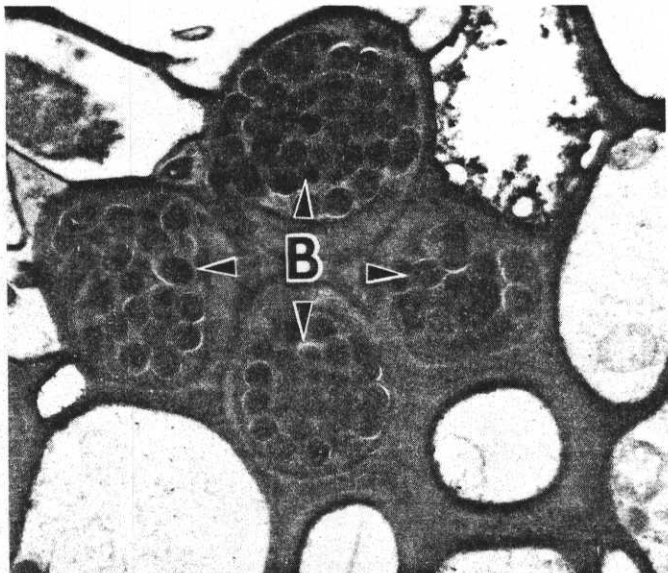


Fig. 1. Diseased C-15: Four xylem vessels with many bacteria (B). X 7,000.



Fig. 2. One bacterium with characteristic rippled cell wall (arrows). X 77,000.

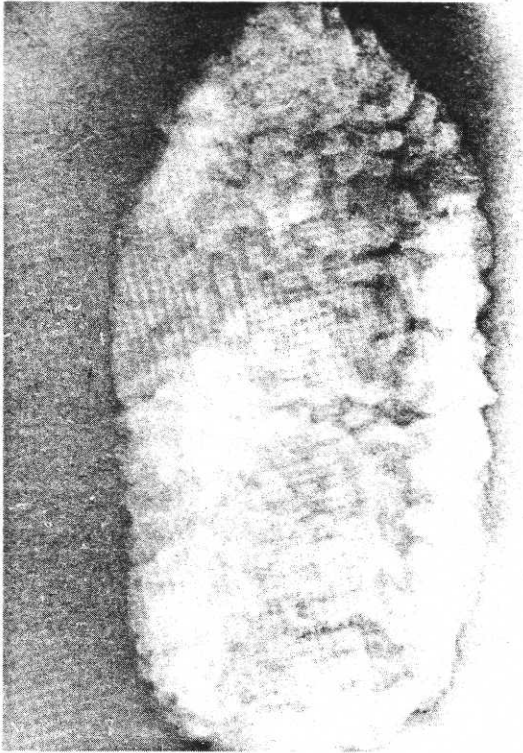


Fig. 3. A bacterium frequently isolated from diseased C-15. X 80,000.

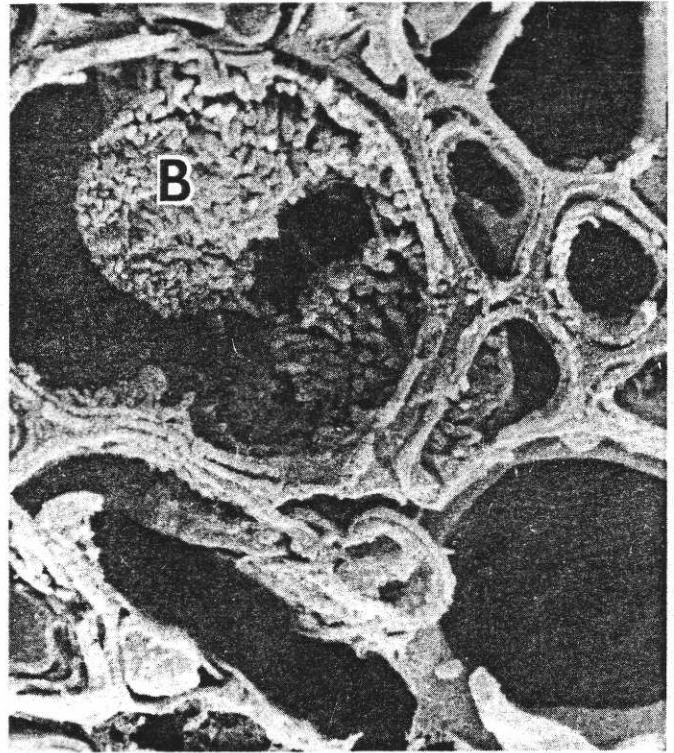


Fig. 4. C-15 inoculated with the frequently isolated bacterium. Bacteria (B) in xylem vessel. X 4,800.

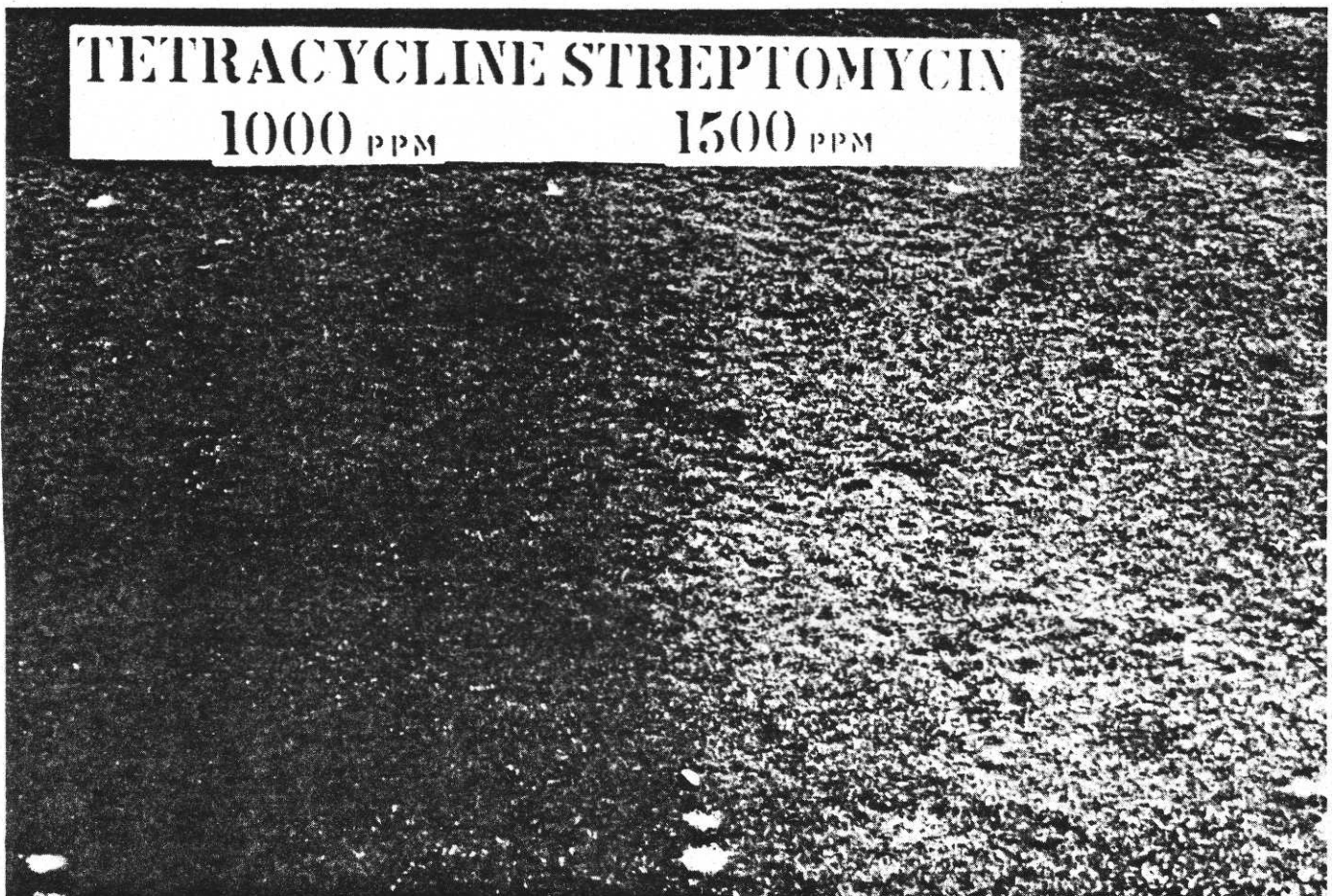


Fig. 5. Antibiotic field plots: 1000 ppm- 50 gal drench of oxytetracycline suppressed the C-15 problem whereas streptomycin did not inhibit disease development.



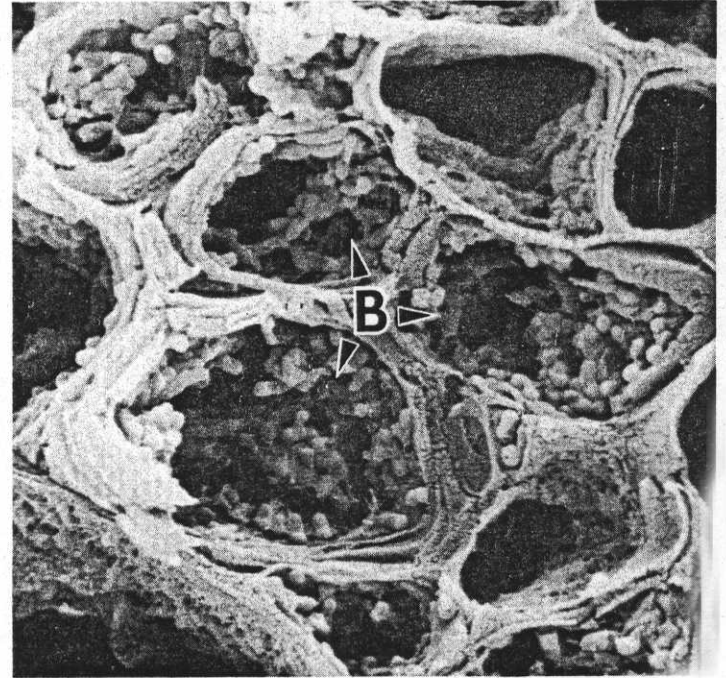
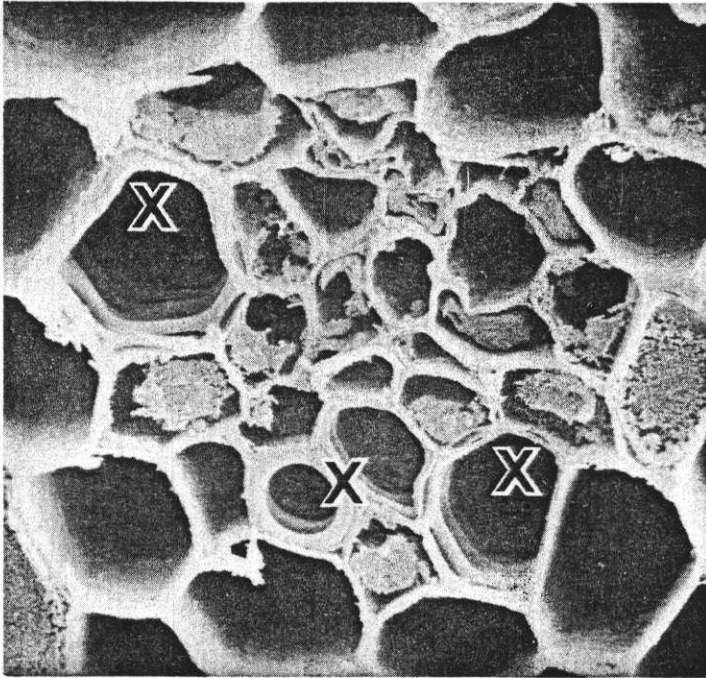


Fig. 6. Bacteria were not found in xylem vessels (X) from oxytetracycline treated plants. X 3,500.

Fig. 7. Xylem vessels of C-15 from untreated or streptomycin treated plots contained many bacteria (B). X 5,600.

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