

# The Birth of Phytobacteriology: Fire Blight Caused by *Erwinia amylovora*

Early discoveries about the nature of fire blight laid the foundation for phytobacteriology and had a major impact on general microbiology, since they occurred at the time when bacteria were being recognized as the cause of human and animal diseases.

## PIONEERS 1790–1940

### Fundamentals of Fire Blight



- 1794 W. Denning was among first to report on the disease, referring to it as a “decay.”
- 1878–1980 T. J. Burrill observed bacteria in infections and infected plants with bacterial exudates.
- 1891 J. C. Arthur cultured the bacterium and transmitted disease via inoculations.
- 1891 M. B. Waite proved transmission of fire blight by insects.

### Dissemination and Transmission

- 1913 H. R. Rosen: insects are of equal or greater importance than water (A. L. Pierstorff, 1931; K. G. Parker, 1936).
- 1916 H. A. Gossard and R. C. Walton: water is the most important agent in dissemination. Later findings indicated that geography was a major factor governing importance (A. N. Brooks, 1926; P. W. Miller, 1929).

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- 1937 E. M. Hildebrand: wind disseminates contaminated pollen and aerial strands of bacteria (S. S. Ivanoff and G. W. Keitt, 1937).

### **Mode of Entry**

- 1915 F. D. Heald: bacteria may invade through hydathodes.
- 1929 P. W. Miller, H. R. Rosen, E. C. Tullis: leaf invasion occurs through stomata and through stems and lenticels (Rosen, 1933).
- 1935–1938 H. R. Rosen and E. M. Hildebrand: bacteria may invade through stigmas, anthers, stomata on pear styles, sepals, hydathodes, and nectarthodes.

### **Survival**

- 1899 T. C. Burrill: bacteria may survive in healthy tissue (L. F. Henderson, 1904; F. M. Bachmann, 1913).
- 1926 A. N. Brooks: bacteria survive in determinate and indeterminate cankers (Rosen, 1929; E. C. Tullis, 1929).
- 1928 H. R. Rosen and A. B. Groves: bacteria survive on alternate hosts (H. E. Thomas and P. A. Ark, 1931, 1934).

### **Bacteriology**

- 1911 D. H. Jones: bacteria vary in growth rates, virulence, and morphology (Ark, 1939).

### **Early Controls and Disease Prediction**

- 1926 A. N. Brooks developed a rudimentary prediction system. Epidemics were favored by temperatures of 65–85°F and other climatic factors.
- 1929 M. McCown: some control achieved with blossom sprays of Bordeaux mixture.
- 1936 K. G. Parker reduced blossom blight with antagonist.

### **LATER ACHIEVEMENTS 1950–2006**

- 1952 A. E. Murneck used streptomycin to control blossom blight (J. W. Heuberger and P. L. Poulos, 1953).
- 1955 W. D. Mills defined relationship among temperature, moisture, and infection (N. S. Luepschen et al, 1961; D. Powell, 1965).
- 1970s M. P. Starr and A. K. Chatterjee: classical genetic analysis of *E. amylovora*, presaging molecular genetics.
- 1972–1975 M. N. Schroth lab developed monitoring tools to quantify epiphytic populations in flowers and insects, leading to forecasting systems (T. D. Miller and M. N. Schroth, 1972; Schroth et al., 1974; S. V. Thomson et al, 1975).

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