

Seedborne bacteria in relation to common blight disease  
incidence on **Phaseolus vulgaris**

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**ABSTRACT**

Seedborne bacteria were isolated from 86 **Phaseolus vulgaris** lines subjected to a high common blight disease pressure caused by **Xanthomonas campestris** pv. **phaseoli** (Xcp) under field conditions. Xcp, pseudomonads and other bacteria of unknown affiliation were isolated. All Xcp were pathogenic and came from plants showing leaf susceptibility to the pathogen. In contrast, all pseudomonads were non-pathogenic.

Xcp was differentiated according to the ability to hydrolyze starch, colony type, and metabolic finger printing. Big colony types (most frequent) were associated with the starch hydrolyzers and the small colony types (least frequent) with the non-hydrolyzers. Xcp strains differed in their ability to oxidize carbon sources.

Pseudomonads belong to the fluorescent group. Pyoverdine pigment production was associated with all isolates. Lowest common blight disease incidence was associated with the seed detection of pseudomonads able to produce phenazine and pyocyanine pigments besides pyoverdine.

**Objectives**

To study bacterial seed transmission on **Phaseolus vulgaris** subjected to high disease pressure of common blight caused by Xcp under field conditions.

To compare bacterial incidence on seeds versus the host reaction to common blight under a high disease pressure.

**MATERIALS AND METHODS**

Eighty six lines were planted at Juana Díaz, Puerto Rico during the wet season. Common blight disease incidence occurred naturally during the rainy season, but to avoid escapes artificial inoculation was performed. Disease severity was rated according to the scale developed by CIAT.

Five healthy pods of each line were selected and disinfected. Each seed was placed in 10 ml of 0.01 M PO<sub>4</sub> buffer. The suspension was serially diluted and streaked on yeast dextrose calcium carbonate agar (YDCA) .

Bacterial isolates were grown on common and semi selective media for growth and enhancement of pigment production. Strains were tested on leaves of susceptible and resistant genotypes according to common blight disease reaction.

**RESULTS**

Xcp was isolated from about 20% of the susceptible lines subjected to a high common blight disease incidence. Fifteen strains of Xcp (22.6% of all bacteria) were isolated and determined pathogenic. Ninety three percent of the Xcp strains hydrolyzed starch. Xcp strains differed in their ability to oxidize carbon sources. Sources carrying Xcp in the seeds showed

disease incidence from 5-9 under field conditions.

None of the pseudomonads were determined pathogenic on leaves of the *P. vulgaris*. Seven bacterial isolates were identified within the fluorescent pseudomonads and produced pyoverdine pigment. Two isolates produced phenazine pigment (pyocyanin). The isolates which produce pyocyanin were related to the lowest bacterial blight disease incidence in the field.

## DISCUSSION

Low disease incidence of common blight under field conditions was related to the seed detection of *Pseudomonas* able to produce pyoverdine and pyocyanin, (phenazine) pigments under in vitro conditions. These results suggest that some *Pseudomonas* may reduce the population of Xcp on germinating seeds by producing antibiotic-like substances such as phenazine. High disease incidence was related to the seed detection of *Pseudomonas* able to produce pyoverdine but no phenazine. These results suggest that *Pseudomonas* which produce siderophores may act synergistically with Xcp.

The role of pigment production in plant pathogen interaction is unknown. Most of the fluorescent pigments (pyoverdines) known from phytopathogenic bacteria belong to the group of substances called siderophores which have been suggested to contribute to the virulence of plant pathogenic bacteria, enable bacteria to survive and grow in an iron deficient environment (Neilands, 1986).

Siderophores have been described for phytopathogenic species such as fluorescent pseudomonads, *A. tumefaciens* and *E. carotovora* (Leong et al 1979), Leong and Neiland, 1982). The use of phenazine has been found effective to control the bacterial leaf blight disease of rice (Oda et al., 1966; Sekizawa et al., 1965; Watanabe and Sekizawa, 1969).

## REFERENCES

- Leong, S. A., Peterson, T. and Neilands, J. B. 1979. Agrobactin, a siderophore from *Agrobacterium tumefaciens*. *J. Biol. Chem.* 254:1860-65.
- Leong, S. A., and Neiland, J. B. 1982. Siderophore production by phytopathogenic microbial species. *Arch. Biochem. Biophys.* 218:351-59.
- Neilands, J. B. and Leong, S. A. 1986. Siderophores in relation to plant growth and disease. *Ann. Rev. Plant Physiol.* 37:187-208.
- Oda, M., Sekizawa, Y. and Watanabe, J. 1966. Phenazines as disinfectants against bacterial leaf blight of the rice plant. *Appl. Microbiol.* 14:365-67.
- Sekizawa, Y., Watanabe, T. and Oda, M. 1965. Effect of phenazine against rice leaf blight bacterium. *Ann. Phytopathol. Soc. Jap.* 30:145-52.
- Watanabe, T. and Sekizawa, Y. 1969. Mechanism of phenazine 5N-monoxide against rice leaf blight bacterium. *Ann. Phytopathol. Soc. Jap.* 35:208-17.