

Short Note 6.1

Argentine Observational Study (1978 to 1979)

A study conducted in Argentina by Dr. Stall and other researchers is often cited as the scientific foundation of the 125-ft rule. It is noted that a 125-ft radius was not consistently applied during Canker War II. In some cases, only a 50-ft radius was used. However, when eradications began in residential areas of Miami-Dade County, the Argentine study suddenly appeared to have considerable importance as 125-ft was used, except where the Risk Assessment Group allowed exceptions for grove owners.

The Argentine Study results were published in 1980 in the Proceedings of the Florida State Horticultural Society. [5] The article was by Dr. Stall with co-authors Drs J.W. Miller (FDACS), and G. Marco and B. I. Canteros. Both Drs. Marco and Canteros are with the INTAC, Bella Vista, an agricultural institute in Argentina. A copy of the paper is available from the Florida Horticultural Society website and from the citrus canker online documents website. The article was very short (5 pages long).

The location of the observations were in Ayui, S.A., Tabay, Corrientes, Argentina. The study was conducted during the 1978 to 1979 growing season. The dates given for observations range from September 1978 to December 1979. In Figure 1 of the paper, a plot of the lesion diameter size verses time is provided, with a note that the beginning of infection was assumed to begin in August 1978.

In Chapter 6 of my book, I characterize this article as a research note, lacking the details of a report on a scientific study. There are no details as to how many trees were studied, nor their size. The means of collection of rainwater was with sterile test tubes. It is not stated how many test tubes were placed under the tree. Further climatic data is absent. In most cases, it is not known if the samples of rainwater collected were of sufficient concentration of bacteria to cause an infection. If a pathogenicity test had been conducted, a determination could have been made.

A total of 6.5 mm of rain came down on October 18, 1978 in four showers beginning at 8:00 to 15:00 hours. The number of cells in each sample was determined by dilution plating. Collected water concentration was 6×10^{-2} cells/ml at a distance one meter from the canopy. These concentrations are lower than researchers generally consider capable of causing infection, even if the inoculum enters a wound.

The authors note that “apparently, the bacteria oozed from the lesions very rapidly and populations were maintained in raindrops on leaves in spite of dilution by continued rainfall.” However, the sparse data and the fact that rainfall was not continuous during the day, complicate any firm conclusion.

Other rain samples collected from March to December 1979, are listed in Table 1.

Table 1:

Argentine Experiments Results from March 1979 to December 1979

When Collected	Where collected	Concentration of bacteria	Pathogenicity test
March 7, 1979	Under canopy 2 and 6 m*	Difficulties with estimates.	Yes- negative results for 2 and 6 m.
April 5, 1979 **	0, 4, 8 and 12 m	Infiltration method shows CC presence for 0, 4 and 8 m.	Negative results for 12 m
Nov 8, 1979	16 m	NA	NA
Dec 13, 1979	32 m	NA	NA

* How distance is measured is not clear. Assumed distance is from trunk of tree.

** Some ambiguity exists on dates, as elsewhere in the paper, the date is given as April 7.

With the March 7 samples, the difficulties with the assays is stated on page 12 as “The rainwater collected under the canopy contained over 10^4 cells/ml of *X. citri* because confluent necrosis developed in the infiltrated leaves of grapefruit seedlings. “ On April 5 (or 7), the article states the infiltration method was used to determine the concentration of bacterium instead of dilution plating.

The maximum distance, with a pathogenicity test is 8 meters.

Opinion of Dr. B.I. Canteros

Dr. Canteros has researched and published many articles on citrus canker, for over 30 years. She was a co-author of Dr. Stall’s articles on the Argentine studies in 1979 to 1982 [3-6], and Dr. Miller’s article in 1979 [2]. She summarized the Argentine studies as follows:

Preliminary data obtained only twice during rainy days has found the bacterium no more than 30 meters from an infected tree (Miller et al, 1980, Stall et al, 1980, 1979). Further studies indicated that this is an exceptional occurrence since most *Xac* cells were found only under infected trees and could not be detected [more than] a few meters from them. [1]

Summary

The research note [5] established that presence of citrus canker in rain water at a distance of 8 m (26.2 ft) on April 5, 1979, from a tree which had symptoms of citrus canker on August 1978. Since there were other citrus in the area, it is possible that the source of the bacteria was closer than this distance. The other samples were not sufficiently tested to show citrus canker capable of causing infections could be transmitted longer distances. Note this occurred in a grove setting, where the high density of planting and open space are ideal for citrus canker dissemination.

References:

1. Canteros, B.I., 2004. Management of Citrus Canker in Argentina, a Review, Proc. Int. Soc. Citriculture, 2004 Paper No. 90.
2. Miller J. W. Stall R. E. , Marcó G. M. , Canteros B. I. 1979. Cancrosis de los citrus- Inf. Inv. Proyecto INTA-IFAS 1978-79. INTA Bella Vista Argentina. Informe No 2. 117 pp.
3. Stall R. E., Marcó G. M., Canteros B. I. 1982. Importance of mesophyll in mature-leaf resistance to canker of citrus. *Phytopathology* 72: 1097-1100.
4. Stall, R. E., Marcó, G. M. y Canteros de Echenique, B. I. 1981. Pathogenicity of three strains of the citrus canker organism on grapefruit. Pag. 334-340, en: Lozano, C. (ed.). Proc. 5th Intern. Conf. Plant Pathog. Bact. CIAT. (Cali) Colombia.
5. Stall, R. E., Marcó, G. M., Canteros, B. I. 1980. Populations dynamics of *Xanthomonas citri* causing canker of citrus in Argentina. Proc. Fla. State Hort. Soc. 93: 10-14.
6. Stall R. E., Marcó G. M., Canteros B. I. 1979. Cancrosis de los citrus- Inf. Inv. Proyecto INTA-IFAS 1978-79. INTA Bella Vista Argentina. Informe No 1. 122 pp.