

# **Wet Rot and Necrosis Caused by Bacteria in *Opuntia ficus-indica* Mill in Santiago del Estero, Argentina**

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## **INTRODUCTION**

*Opuntia ficus-indica* Mill is cultivated in marginal areas of Santiago del Estero province for its fruit. In the last few years, its cultivation has increased as a result of favorable market conditions for the fruit, resulting in the transfer of vegetative propagation material to new locations.

Cactus tolerates drought and little technology is required to get profitable levels of production. Recently, in Santiago del Estero, a disease that produces severe damage to the cactus plantations has appeared. This disease appears as wet spots on the epidermis of cladodes and, finally, coalesces, acquiring an orange-brown color that gets darker as the disease progresses. The infected tissue eventually becomes dried or rotten and causes the cladode to break off the mother plant.

Similar symptoms to those observed in these local cacti were also observed in Sicily (Granata and Varvaro 1990; Varvaro et al. 1993), where the causal organism was *Erwinia*. Therefore, the presence of *Erwinia* in these areas is presumed.

## **MATERIALS AND METHODS**

Cladodes of *O. ficus-indica*, with the characteristic symptoms, were obtained from different plantations in Santiago del Estero, Argentina (Figures 1 and 2).

Pieces of healthy and diseased tissue were placed in Petri dishes with potato-agar and nutritive-agar. Petri dishes were maintained at 27°C. After 17 hours, colonies developed in the potato-agar medium. The nutritive agar media did not show any development of bacteria, and use of this media was discontinued. The presumptive pathogen was continually transferred to new media until it was successfully isolated.

Macroscopic observations were made to describe the morphological characteristics of the colonies. Microscopic observations were made *in vivo* and with Gram stain. A strain was sent to the Instituto di Patologia Vegetale, University of Catania, Italy, to be compared with the bacterium isolated and identified there. Pathogenicity tests were carried out to verify Koch postulates by inoculating healthy cladodes with the isolated pathogen. Inoculation was carried out in two ways:

- Injecting the pathogen into healthy cladodes using a syringe
- Spraying the pathogen on wounds made in healthy cladodes

## **RESULTS AND DISCUSSION**

All the colonies were convex, butyraceous, grey-white, dry, had irregular edges, and adhered to the media when observed macroscopically (Figure 3). Microscopic observation demonstrated that the

bacterial cells, in vivo, were rod-shaped, not sporulative, and were motile with peritrichous flagella. The Gram test was negative.

In healthy cladodes inoculated with the isolated pathogen, the same symptoms were produced (Figure 4). The first symptoms in inoculated cladodes were observed after two days in injected cladodes and after four days in sprayed cladodes. As the bacteria from the artificially inoculated cladodes produced typical symptoms, it is presumed the pathogen was the same.

This presumption was confirmed by the biochemical tests carried out in the Italian laboratory. As they confirm with biochemical studies that the bacteria found in *O. ficus-indica* from La Rioja, Santiago del Estero y Salta, must be classified as *Erwinia carotovora* subsp. *carotovora*. This pathogen was not cited previously in *Opuntias* of this area.

#### **LITERATURE CITED**

Granata, G. and Varvaro L. 1990. Bacterial spots and necrosis caused by yeasts on prickly pear cactus in Sicily. 8<sup>th</sup> Congress of the Mediterranean Phytopathological Union. Agadir, Morocco.

Varvaro, L., G. Granata, and G.M. Balestra. 1993. Severe *Erwinia*-Caused Damage on *Opuntia ficus-indica* in Italy. *J. Phytopathology* 138:325-330.

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Figure 1. Cladode From La Rioja, With Initial Symptoms



Figure 2. Plant From Santiago del Estero  
With Severely Infected Cladodes

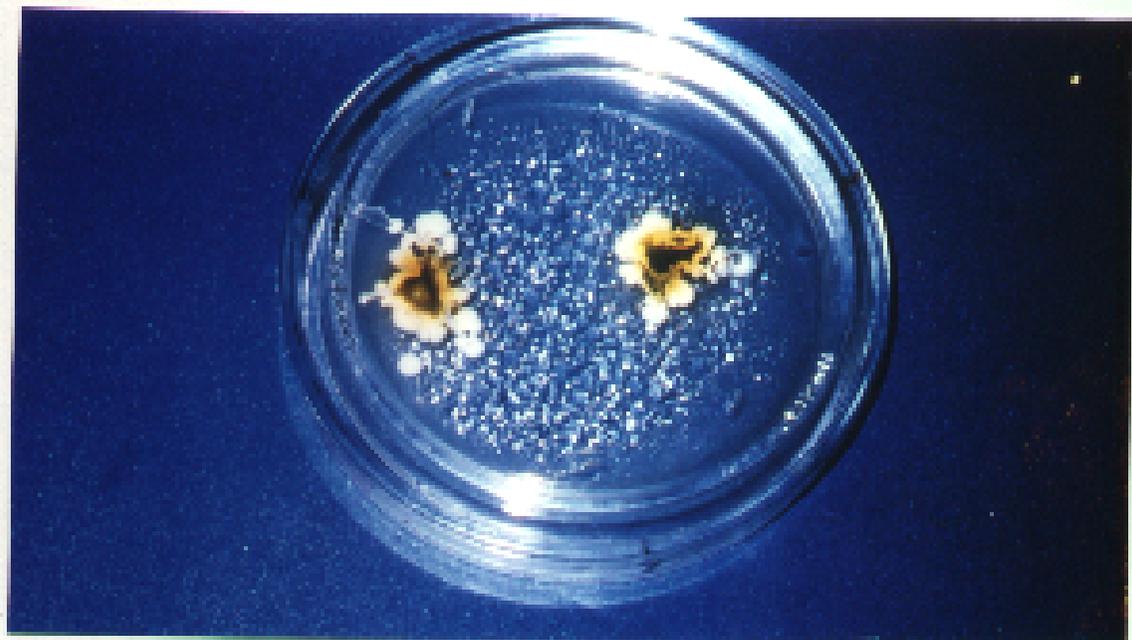


Figure 3. Colonies of the Pathogen Isolated From Diseased Cladodes



Figure 4. Healthy Cladodes Inoculated With the Pathogen, Five Days After Inoculation