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## Effects of Citrus Variegated Chlorosis (CVC) Infection and Symptom Expression on Peroxidase and $\beta$ -1,3-Glucanase Activities

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**ABSTRACT.** Budwood of plants affected by citrus variegated chlorosis (CVC) and healthy plants from an orchard in the Minas Gerais State were multiplied at the Sylvio Moreira Citriculture Center. New methods of inoculation using material rich in *Xylella fastidiosa*, as the leaves main central veins and petioles were tested. In biochemical studies, a substantial difference of 300% to 700% was found on the activity of peroxidase enzyme, higher on leaves affected by CVC as compared with leaves from non-inoculated healthy plants.

In orchards severely affected with citrus variegated chlorosis (CVC), the occurrence of asymptomatic sweet orange trees showing normal production was observed. Budwood was collected from diseased and healthy trees of different varieties for transmission studies. New methods of

transmission are being developed using tissue rich in *Xylella fastidiosa*, such as the main vein and the petiole of affected leaves, compared with the same material of healthy leaves.

Preliminary comparative analysis of some pathogenesis-related proteins (PR-proteins) in healthy,

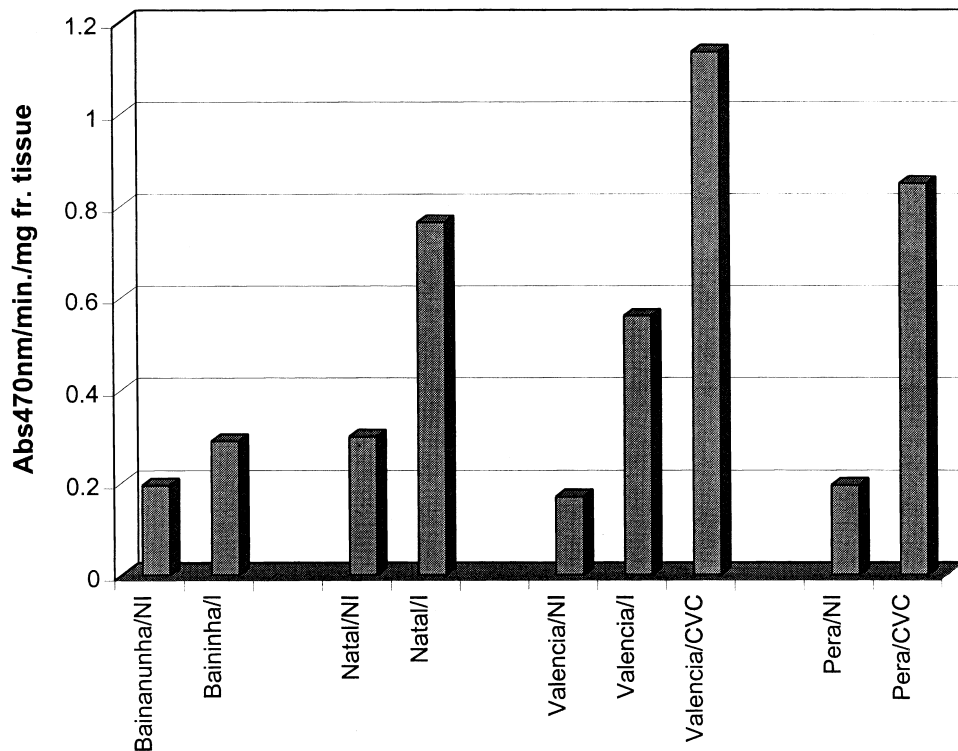


Fig. 1. Effects of citrus variegated chlorosis (CVC) infection and symptom expression on peroxidase activity in different sweet orange varieties. NI = not infected; I = infected; CVC = heavily affected by CVC.

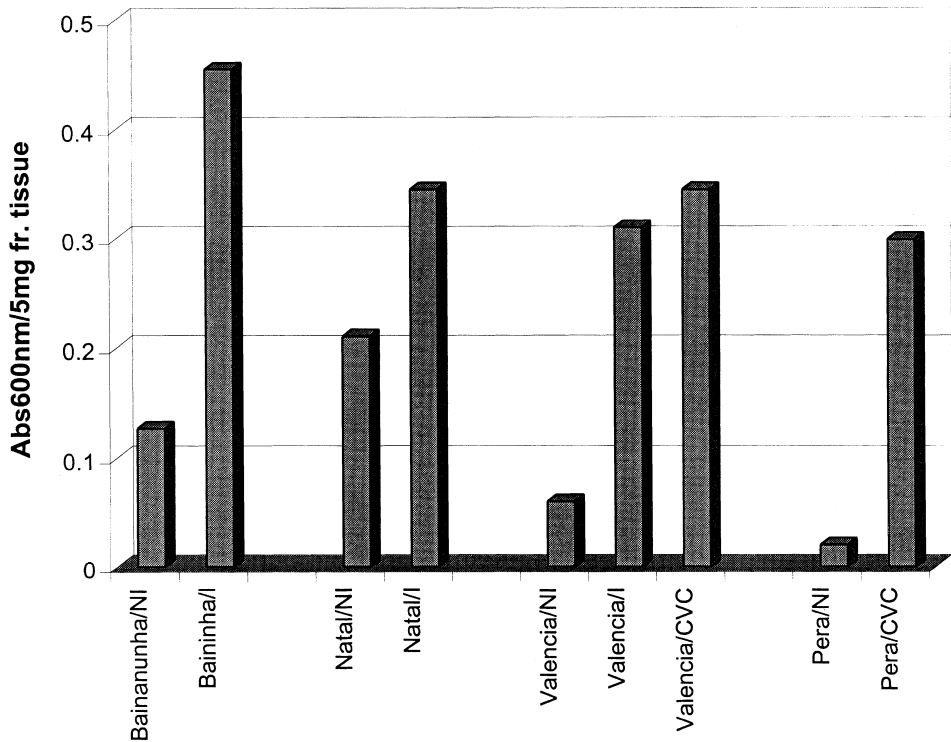


Fig. 2. Effects of citrus variegated chlorosis (CVC) on  $\beta$ -1,3 glucanase activity in healthy (NI), heavily affected (CVC), and asymptomatic (I) leaves of different sweet orange varieties.

severely CVC-symptomatic, and asymptomatic leaves were conducted. The proteins from the leaves were extracted in acetate buffer (50 mM, pH 5). Peroxidase and  $\beta$ -1,3-glucanase activities were estimated by colorimetric quantification of oxidated guaiacol (*o*-methoxyphenol) (1) and of soluble oligomers of  $\beta$ -1,3-carboxymethylated glucan labeled with remazol brilliant blue (CM-Curdlan-RBB), respectively (2).

Leaves of inoculated plants, although without CVC symptoms, as well as the naturally-infected ones showing heavy symptoms, contained elevated levels of peroxidases (Fig. 1) and  $\beta$ -1,3-glucanase (Fig. 2) activity up to 700 times higher than those of not inoculated leaves.

Usually plants react to the presence of pathogens by expressing a

series of genes, among them, those that code for the PR-proteins (3). The phenomenon of defense developed in response to pathogen infection has been known for a long time. It may be possible to induce or stimulate an acquired resistance in a plant by the inoculation of attenuated pathogen. The virulence of a pathogen can vary due to many interacting factors including environmental conditions or a certain degree of resistance of the host plant.

The fact that some plants have grown asymptotically for long time in orchards highly affected by CVC could mean that they have an induced resistance state. In this condition, the tree, even after pathogen inoculation, may not to show any visible symptoms but may express an increase of these mentioned enzyme levels.

### LITERATURE CITED

1. Flott, B. E., B. M. Moerschbacher, and H. J. Reisner  
1989. Peroxidase isoenzyme patterns of resistant and susceptible wheat leaves following stem rust infection. *New Phytol.* 111: 413-421.
2. Guzzo, S. D. and E. M. F. Martins  
1996. Local and systemic induction of  $\beta$ -1,3-gluconase and chitinase in coffee leaves protected against *Hemileia vastatrix* by *Bacillus thuringiensis*. *J. Phytopathol.* 144: 449-454.
3. Hammond-Kosack, K. E. and J. D. G. Jones  
1996. Resistance gene-dependent plant defense responses. *The Plant Cell* 8: 1773-1791.