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SODs Isoforms by *Mycosphaerella fragariae* Infection in Two Resistant and Susceptible Cultivars in Strawberry

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Abstract

Two strawberry cvs examined in this study have different susceptibility to *M. fragariae*. The results of the study suggest that resistant cv possess an advanced antioxidant defense system, which is able to increase specific SOD activity through synthesizing new isoforms and effective regulation of them to bypass oxidative burst during the pathogen attack.

Introduction

Leaf spot is one of the most widespread foliar diseases in strawberry in Canada and the United States, which is caused by *Mycosphaerella fragariae*. Enhancement of reactivated oxygen species (ROS) production by plant cells induced by pathogen attack and other stresses, resulting imbalance between oxidative stress and the detoxification defense systems. Among different antioxidants, superoxide dismutases (SODs) are the major scavengers of ROS. SOD is an enzyme that catalyzes dismutation of superoxide anion ($O_2^{\cdot}$) into hydrogen peroxide and oxygen: $2O_2^{\cdot} + 2H+ \rightarrow H_2O_2 + O_2$.

To understand the mechanism underlying *M. fragariae* attack and specific regulation of SODs activity in strawberry, the present study was accomplished, emphasizing on relationship between various SOD isoforms regulation and susceptibility to the pathogen under controlled conditions.

Material and Methods

Two strawberry cultivars, Joliette (resistance) and Kent (susceptible), were inoculated by *Mycosphaerella fragariae* pathogen. Total and specific SOD activities in plants were evaluated using spectrophotometer and electrophoresis. For separation of SOD isoforms, continuous native polyacrylamide gel electrophoresis was performed. Different types of SOD isoforms were recognized by incubation of gels prior to staining into 3 mM KCN and 10 mM H_2O_2 each for 30 min, as inhibitors of CuZn-SOD and CuZn-SOD, Fe-SOD activity, respectively.

Results and Discussion

Macroscopic symptoms with varying degree of intensity depending on susceptibility of cvs characterized as red spots were observed after thirty d of leaf tissue inoculation (Fig. 1).

Fig. 1

Inoculation resulted an increase in total and specific SOD activities in both cultivars (Fig. 2), however higher level was observed in resistant cv.

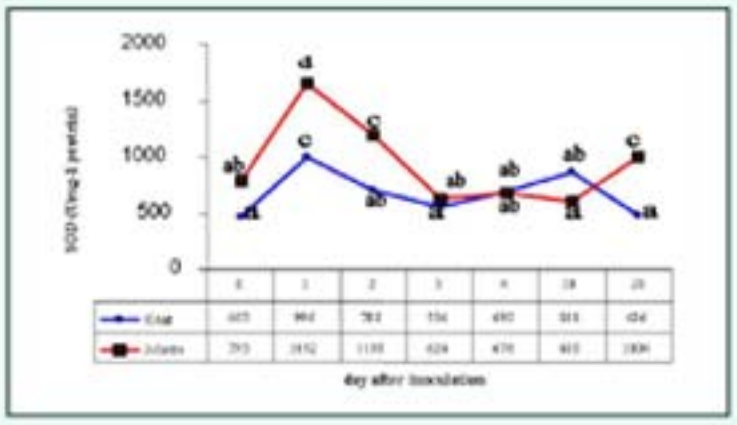

Fig. 2

SOD isoform, CuZn-SOD with 16 kD MW, was detected in all soluble proteins derived from resistant cv. This isoform was not observed in susceptible cv, however, when the amount of loaded protein was increased, it was illuminated as a faint band in sample collected 3 d after inoculation, indicating insufficient production of CuZn-SOD isoform in susceptible cv during oxidative burst induced by *M. fragaria* pathogen. Unlike in resistant that the activity of Fe,Mn-SOD isoforms gradually and regularly increased and reached to the highest level in the third d of inoculation, in susceptible cv the activity of the isoforms irregularly changed over 20 d of survey (Fig. 3). The present study suggests that by enhancing of SOD antioxidant activity, in particular, induction of different MnFe-SOD and also by the involvement of a CuZn-SOD, resistant cv could avoid oxidative burst during the pathogen attack.

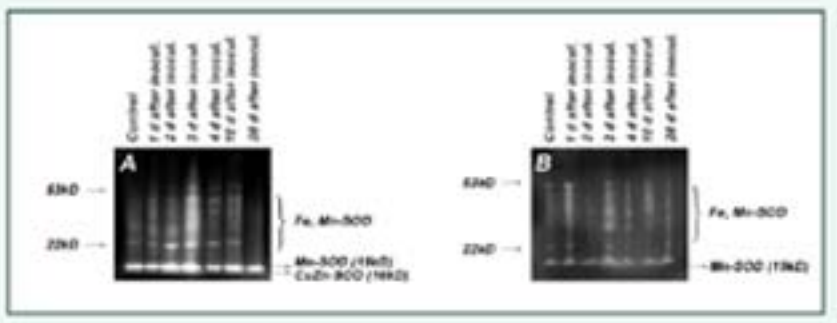

Fig. 3. A: Resistant cv. B: Susceptible cv.

Some useful References

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