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Mycosphaerella fragariae pathogen affects on superoxide dismutase isoforms produced by strawberry cultivars

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Introduction

An increase in ROS (**Reactive Oxygen Species**) production by plant cells, induced by pathogen attack and other stresses, results in an imbalance between oxidative stress and detoxification defence systems. Among the various anti-oxidants, **superoxide dismutases** (SODs) are the major scavengers of ROS. Evidence indicates that increased activity of SOD and its isoforms in plant tissue may be associated with resistance to environmental stresses, such as drought and frost, and to pathogen attack. **The present study was undertaken to understand the regulation of SOD isoenzymes induced in strawberry cultivars by the *M. fragariae* pathogen.**

Materials & Methods

Two strawberry cultivars (*Fragariae X ananassa* Duschesne), Joliette (resistant) and Kent (susceptible), were used and inoculated with *Mycosphaerella fragariae* (Tul.) Lindau (*Ramularia tulasnei* Sacc.).

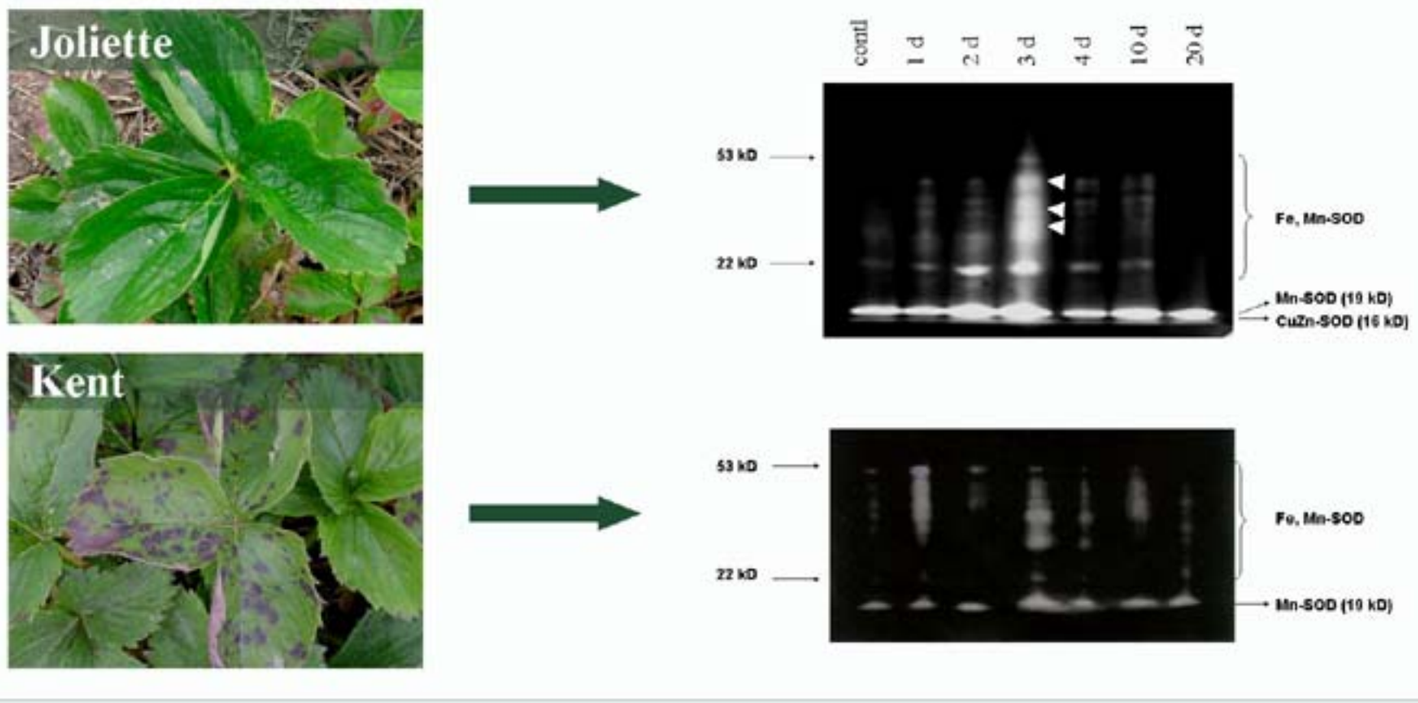
Samples of expanded young leaves (0.5 g) from control and inoculated plants were collected at 1, 2, 3, 4, 10, and 20 days after inoculation and used for total protein extraction.

To separate SOD isozymes, continuous native polyacrylamide gel electrophoresis (PAGE) was performed with a PROTEAN III vertical electrophoresis unit (Davis 1964) with some modifications.

Results & Discussion

Our data suggest that the resistance of the 'Joliette' cultivar to red spot disease infection may be related to the suppression of oxidative bursts and cell death induced by the *M. fragaria* pathogen in a timely manner and in such a way that several Mn,Fe-SODs and one Mn-SOD are regulated to reach maximum activity when most needed. The involvement of a CuZn-SOD in the defence system of the resistant cultivar, which was not detected in the interaction between the susceptible cultivar and the pathogen, deserves further consideration. In the interaction between 'Kent' as a susceptible cultivar and *M. fragaria*, rapid necrosis and cell death leading to the expression of severe symptoms, are perhaps the consequence of unsuccessful regulation of SOD isoforms to adequately scavenge superoxide anions generated during pathogen attack.

Macroscopic symptoms were observed in two strawberry cultivars, with the degree of symptom intensity varying depending on the susceptibility of the cultivars. A comparison of the superoxide dismutase isoform profiles obtained by gel electrophoresis in all samples extracted from both resistant and susceptible cultivars indicated one constant sharp band, identified as Mn-SOD with a molecular mass of 19 kD. The intensity of this band was higher in all samples derived from the resistant cultivar than in those from the susceptible cultivar. Another superoxide dismutase isoform, identified as CuZn-SOD with a molecular mass of 16 kD, was detected in all soluble proteins derived from the resistant cultivar. Several bands were also characterized in both cultivars containing Fe and Mn as their co-factors (Fe,Mn-SOD). Unlike in the resistant cultivar, where the activity of Fe,Mn-SOD isoforms gradually and regularly increased and reached its highest level on the third day after inoculation, the activity of the isoforms changed irregularly over 20 days of study in the susceptible cultivar.



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