

Isoform-Specific Responses of Superoxide Dismutase to Oxidative Stresses and Hormones in Paraquat-Tolerant *Rehmannia glutinosa*

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Objective

Rehmannia glutinosa shows a unique characteristic of intrinsic tolerance to paraquat. The higher level of endogenous superoxide dismutase (SOD) activity and its increase upon paraquat treatment indicated the involvement of SOD in paraquat tolerance in *R. glutinosa*. This study was carried out to investigate the isoform-specific response of SOD to oxidative stresses and hormones.

Materials and Methods

- Plant materials
 - *R. glutinosa* (accession Namwon).
- Experimental methods
 - Stress and hormone treatments: 5.6 mM paraquat, 5 mM salicylic acid (SA), 5 mM ethephon (ET), and 25 mg/ml yeast extract (YE).
 - SOD isoform identification and activity staining: Non-denaturing polyacrylamide (PA) gel electrophoresis staining for SOD activity (Beyer and Fridovich, 1987).

Results and Discussion

Six SOD isoforms were found in the leaf, and they were identified as two MnSODs (named MnSOD I and MnSOD II, in order of increasing mobility), one FeSOD and three Cu/ZnSODs (named Cu/ZnSOD I, Cu/ZnSOD II and Cu/ZnSOD III, in order of increasing mobility). In control leaves, MnSOD I, MnSOD II, FeSOD, Cu/ZnSOD I, Cu/ZnSOD II, and Cu/ZnSOD III, contributed 4, 11, 7, 15, 30, and 32% of the total SOD activity, respectively. Total SOD activity levels were increased by 4, 24, and 21% by paraquat, salicylic acid (SA), and yeast extract (YE), respectively, but little by ethephon. SOD isoforms responded differentially to the stresses and hormones. MnSOD I and FeSOD were increased by paraquat, CuZnSODs by SA, and MnSODs by YE. However, MnSOD I and II were significantly decreased by SA and paraquat, respectively. These results suggest that amelioration of oxidative stresses by SOD is fine-tuned by the differential regulation of isoforms in *R. glutinosa*. This research was supported by a grant from the BioGreen21 Program, Rural Development Administration, Republic of Korea.

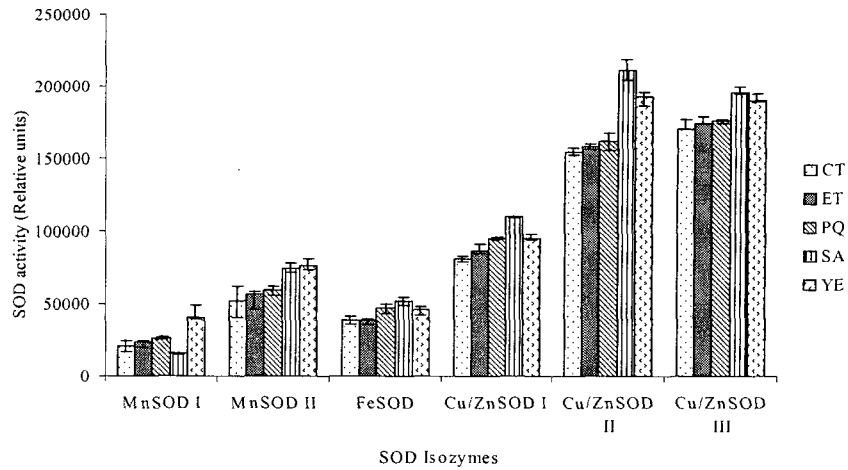


Figure 1. Effect of oxidative stresses and hormones on the activity of superoxide dismutase isozymes in *R. glutinosa*. SOD activity as determined by scanning the gel using gel documentation system, area expressed as relative units. Vertical bars indicate SE (n = 3).

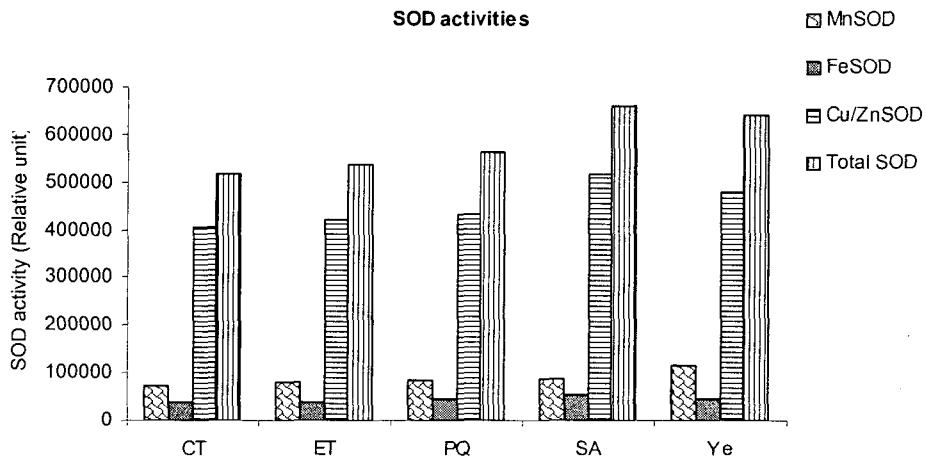


Figure 2. Effect of oxidative stresses and hormones on the activity of superoxide dismutase isozymes in *R. glutinosa*. SOD activity as determined by scanning the gel using gel documentation system, area expressed as relative units.