Enhanced β-Glucosidase in western flower thrips affects its interaction with the redox-based strategies of kidney beans under elevated CO 2

Xiaowei Liu[1], Yanhui Wang[1], Hui Liu[1], Xinyi Huang[1], Lei Qian[2], Baoqing Yang[3], Yujing Xu[3], and Fajun Chen[1]

[1]Nanjing Agricultural University College of Plant Protection
[2]Jiangsu Academy of Agricultural Sciences
[3]Nanjing University of Chinese Medicine

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Abstract

β-Glucosidase is validated as an elicitor for early immune responses in plants and it was detected in the salivary glands of *Frankliniella occidentalis* in previous research. Seven differentially expressed genes encoding β-Glucosidase were obtained by comparing the transcriptomes of *F. occidentalis* adults grown under two different CO $_2$ concentrations (800 ppm vs. 400 ppm), which might be associated with the differences in the interaction between *F. occidentalis* adults and its host plant, *Phaseolus vulgaris* under different CO $_2$ levels. To verify this speculation, changes in defense responses based on the production and elimination of reactive oxygen species (ROS) in *P. vulgaris* leaves treated with three levels of β-Glucosidase activity under ambient CO $_2$ (aCO $_2$) and elevated CO $_2$ (eCO $_2$) were measured in this study. The results showed that both leaves infested with thrips and those sprayed with the pure β-Glucosidase solution showed significant increases in ROS levels under aCO $_2$ and eCO $_2$, and the activities of antioxidant enzymes including superoxide dismutase (SOD), peroxidase (POD), and catalase (CAT) were increased correspondingly, while in leaves infested with *ΦοβΓλυ-1*-silenced thrips, the ROS levels and activities of these enzymes did not change significantly during the first 12 hours of injury regardless of CO $_2$ level. Besides, significantly higher levels of ROS and lower activities of SOD, POD and CAT in injured leaves under eCO $_2$ compared to aCO $_2$ were noticed, which would negatively affect *P. vulgaris* leaves and facilitate thrips damage.

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