β-Aminobutyric acid treatment accelerates the deposition of suberin polyphenolic and lignin at wound sites of potato tubers during healing

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Abstract

β-Aminobutyric acid (BABA) is a nonprotein amino acid that induces plant defense responses to numerous biotic and abiotic stresses. However, whether BABA treatment affects the wound healing process of potato tubers has yet to be reported. In this study, we examined the effects of BABA treatment on the weight loss and disease index of *Solanum tuberosum* L. cv. Atlantic potato tubers inoculated with *Fusarium sulphureum* and assessed the deposition of suberin polyphenolic (SPP) and lignin at the wound sites of these tubers during healing. We also investigated the indexes involved in phenylpropane metabolism, H_2O_2, and peroxidase in the underlying effect mechanism. BABA treatment effectively reduced the weight loss of wounded tubers (by 41.0 %) and the disease index of inoculated tubers (by 43.2 %) during healing (at 21 d and relative to the control). BABA treatment also accelerated the deposition of SPP and lignin at wound sites. SPP and lignin cell layers in the treated tubers were 58.45 % and 54.72 % thicker, respectively, than the equivalent cell layers in the controls at 7 d of healing. Additionally, BABA treatment significantly enhanced the activities of phenylalanine ammonia-lyase (PAL), 4-coumaryl coenzyme A ligase (4CL), cinnamic acid-4-hydroxylase (C4H), and cinnamyl alcohol dehydrogenase (CAD) while also promoting the synthesis of cinnamic acid, *p*-coumaric acid, caffeic acid, ferulic acid, sinapic acid, cinnamyl alcohol, coniferyl alcohol, and sinapyl alcohol, as well as increasing total phenolic and lignin content, at wound sites during healing. Furthermore, BABA treatment increased H_2O_2 content and peroxidase activity at the wounds. These results suggest that BABA treatment activates phenylpropanoid metabolism, increases H_2O_2 content and peroxidase activity, and accelerates the deposition of SPP and lignin in potato tuber wounds, all of which lead to reductions in the weight loss and disease index of tubers during healing.