Reactive oxygen species-mediated the accumulation of suberin polyphenolics and lignin at wound sites on muskmelons elicited by benzo (1, 2, 3)-thiadiazole-7-carbothioic acid S-methyl ester

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Postharvest Biology and Technology, Volume 170, December 2020, 111325

Abstract

Benzo (1, 2, 3)-thiadiazole-7-carbothioic acid S-methyl ester (BTH) is the first synthetic nontoxic chemical elicitor that has induced resistance in fruit and vegetables against postharvest diseases. In this study, we treated artificially wounded muskmelon fruit (*Cucumis melo* L. cv. Perfect) with 100 mg L^{-1} BTH. The results indicated that there was a significant accumulation of suberin polyphenolics and lignin at wound sites on the treated fruit as well as a noticeable decrease in weight loss of wounded fruit during healing. The BTH treatment also enhanced the activity of NADPH oxidase and superoxide dismutase, increasing the production of $O_2^{\bullet-}$ and H_2O_2. Moreover, BTH activated the activity of phenylalanine ammonia-lyase, cinnamate-4-hydroxylase, 4-coumarate-CoA ligase, and cinnamyl alcohol dehydrogenase as well as elevating the levels of cinnamic acid, *p*-coumaric acid, caffeic acid, ferulic acid, sinapic acid, coniferyl alcohol, sinapyl alcohol, and lignin at the wound sites on the treated fruit. When we treated the BTH-treated muskmelons with 50 μmol L^{-1} diphenylene iodonium (DPI), the treatment partially inhibited the accumulation of polyphenolic substances and lignin at wound sites on the treated fruit, weakened the activity of NADPH oxidase and superoxide dismutase, and reduced the production of $O_2^{\cdot-}$ and H_2O_2. Furthermore, BTH combined with DPI treatment caused lower activity of key enzymes and lower level of metabolites in phenylpropanoid pathway compared with BTH treatment. Considering DPI as a reactive oxygen species inhibitor, we suggest that reactive oxygen species could be a second messenger for activating phenylpropanoid metabolism, as a consequence for promoting polyphenolic substances and lignin accumulation and reducing weight loss in the BTH-treated muskmelons during healing.