Title Methyl jasmonate-induced defense responses are associated with elevation of 1-aminocyclopropane-1-carboxylate oxidase in *Lycopersicon esculentum*fruit

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Citation Journal of Plant Physiology, Volume 168, Issue 15, 15 October 2011, Pages 1820-1827

Keywords ACO; Ethylene; Gene expression; Methyl jasmonate; Tomatofruit

Abstract

It has been known that methyl jasmonate (MeJA) interacts with ethylene to elicit resistance. In green mature tomatofruits (*Lycopersicon esculentum* cv. Lichun), 0.02 mM MeJA increased the activity of 1-aminocyclopropane-1-carboxylate oxidase (ACO), and consequently influenced the last step of ethylenebiosynthesis.Fruits treated with a combination of 0.02 MeJA and 0.02 α-aminoisobutyric acid (AIB, a competitive inhibitor of ACO) exhibited a lower ethylene production comparing to that by 0.02 mM MeJA alone. The increased activities of defense enzymes and subsequent control of disease incidence caused by *Botrytis cinerea* with 0.2 mM MeJA treatment was impaired by AIB as well. A close relationship ($P< 0.05$) was found between the activity alterations of ACO and that of chitinase (CHI) and β-1,3-glucanase (GLU). In addition, this study further detected the changes of gene expressions and enzyme kinetics of ACO to different concentrations of MeJA. *LeACO1* was found the principal member from the ACO gene family to respond to MeJA. Accumulation of *LeACO1/3/4* transcripts followed the concentration pattern of MeJA treatments, where the largest elevations were reached by 0.2 mM. For kinetic analysis, K_m values of ACO stepped up during the experiment and reached the maximums at 0.2 mM MeJA with ascending concentrations of treatments. V_{max} exhibited a gradual increase from 3 h to 24 h, and the largest induction appeared with 1.0 mM MeJA. The results suggested that ACO is involved in MeJA-induced resistance in tomato, and the concentration influence of MeJA on ACO was attributable to the variation of gene transcripts and enzymatic properties.