

A novel aspartic protease inhibitor inhibits the enzymatic browning of potatoes

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Abstract

Enzymatic browning greatly affects the quality of fresh-cut potatoes (*Solanum tuberosum* L.). The transcript level of a novel aspartic protease inhibitor gene, *StASPI*, was found significantly higher in browning-less potatoes than in browning-susceptible potatoes, and exogenous aspartic protease inhibitor Pepstatin A inhibited the browning of potato pulp. Therefore, we speculated that *StASPI* plays important roles in browning-resistance of potatoes. The effects of overexpressed-*StASPI* on browning, total free amino acids (FAAs), antioxidant enzyme activity and ROS accumulation in potatoes were investigated in this study. Results showed that overexpression of *StASPI* effectively reduced enzymatic browning after cutting, significantly decreased protease activity, and reduced the accumulation of total FAAs in potatoes. Browning degrees of transgenic potato mash were increased by supplementing exogenous FAAs, but the degrees were still significantly lower than that of wild-type (WT) mash. Furthermore, overexpression of *StASPI* decreased PPO activity, enhanced the activities of antioxidant enzymes SOD and CAT, and reduced H₂O₂ and O₂^{·-} contents. These results indicated that overexpression of *StASPI* inhibited the enzymatic browning of potatoes, decreasing FAAs accumulation, reducing PPO activity, and enhancing activity of antioxidant enzymes. This study provides a new perspective on the strategies for inhibiting enzymatic browning of potatoes.