Aspartic acid can effectively prevent the enzymatic browning of potato by regulating the generation and transformation of brown product

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Abstract

Enzymatic browning is a crucial factor affecting the quality of fresh-cut potatoes. In this study, the effects of aspartic acid (Asp) on browning, polyphenol oxidase (PPO) activity, and phenolic substrates were investigated. The results showed that all the Asp solution treatments significantly reduced the browning of fresh-cut potato chips. At 2–4 °C, control chips had lost saleability on day 1, while 1.0 % Asp treated chips were still acceptable on the day 7 evaluation. Asp can prevent the discoloration of potato pulp completely and also partly decolorize the brown color. Addition of Asp decreased the PPO activity of potato pulp. At the same pH, the PPO activities of potato pulps treated with Asp were lower than those treated with phosphoric acid (H_3PO_4). With the recovery of pH to the control level, the activity of the Asp-treated pulp did not improve completely like those treated with H_3PO_4. Moreover, the addition of copper acetate solution to the Asp-treated pulp significantly increased PPO activity. As browning progressed, tyrosine and chlorogenic acid content in the Asp-treated potato pulp was higher than that of the control, but caffeic acid, gallic acid, and protocatechuic acid content did not increase. In vitro simulation experiments demonstrated that Asp prevented the discoloration of tyrosine and chlorogenic acid solution, and also caused the fading of the discoloration to a certain degree. These results indicated that Asp is a promising anti-browning agent for fresh-cut potato and the mechanism involves the reduction of PPO activity via a decrease in pH and chelating Cu^{2+} by Asp, inhibiting the formation of brown color from tyrosine and chlorogenic acid solution and enhancing the fading of the brown color.