Investigate the effects and mechanisms of High Voltage Electrostatic Field on enzyme activity and browning of apple juice

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ABSTRACT

Fruit quality deterioration such as tissue and oxidative deterioration with storage time after harvest was due to the oxidative stress and tissue enzyme activation and lead to economic losses. This study was to investigate the effect of HVEF on the tissue and oxidative deterioration during the different conditions of temperature and electric field strength of Malus domestica after harvest. In this study, we used the treatment time as 2 hours and with different electric field strength (Control, 100 kV/m, 300 kV/m, 600 kV/m), and then investigated their change within 7 days under 4°C and 23°C. The result showed that the control increased 84.2% based on the color changes (△E) from 0.15 to 0.95. The increasing rates of HVEF treatments of 100 kV/m, 300 kV/m, and 600 kV/m were 59.4%, 21.1%, and 6.25%, separately. The control of pectin esterase (PE), activity increased 3.63% from 5.681 to 5.882. The decreasing rates of HVEF treatments 100 kV/m and 300 kV/m were 64.3% and 71.3%, separately; but was increasing 8% for 600 kV/m treatment. The control of phenylalanine ammonialyase (PAL), activity changed from 0.037 to 0.039. The increasing rates of HVEF treatment of 100 kV/m, 300 kV/m, and 600 kV/m were 49%, 34%, and 13%, separately. The control of polyphenol oxidase (PPO) activity increased 50% (from 0.2-0.3). The increasing rates of HVEF treatment 100 kV/m and 300 kV/m were 100% and 50%, separately; but was decreasing 50% for 600 kV/m treatment. The control turbidity decreased 87.8% from 92.12 to 11.15. The increasing rates of HVEF treatment of 100 kV/m, 300 kV/m, and 600 kV/m were 76.9%, 78.7%, and 74.7%, separately. Therefore, HVEF can efficiently reduce the color change and inhibit multiple enzyme activity to delay the oxidative and organizational deterioration.

Keywords: high voltage electrostatic field, Malus domestica, malondialdehyde, pectin esterase, phenylalanine ammonialyase, polyphenol oxidase, turbidity

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