Physiological and biochemical characteristics of sweet potato (*Ipomoea batatas* (L.) Lam) roots treated by a high voltage alternating electric field during cold storage

Linjiang Pang, Guoquan Lu, Jiyu Cheng, Xinghua Lu, Daifu Ma, Qiang Li, Zongyun Li, Jian Zheng, Congfeng Zhang and Shenyuan Pan

Postharvest Biology and Technology, Volume 180, October 2021, 111619

Abstract

Physical methods for preserving agricultural products without using chemicals or radiation are increasingly being explored. The effects of high-voltage alternating electric field (HVAEF) on the physiology and biochemical processes of sweet potato roots during cold storage for 60 d were investigated in this study. Roots were treated with HVAEF (4 kV m^{-1}) and stored at 13 ± 1 °C and 85–90 % relative humidity. Studies on sweet potato root quality, antioxidant metabolic pathway, and sugar metabolic pathway showed that HVAEF treatment could maintain the integrity of cell membrane, reduce respiration rate, and delay the loss of starch and water in the sweet potato roots. Scanning electron microscopy analysis revealed that HVAEF treatment was helpful in maintaining the integrity of starch granules. Nuclear magnetic resonance analysis revealed that HVAEF treatment could affect the distribution and migration of water in sweet potato. Furthermore, the hydrolysis of starch and loss of water in sweet potatoes were effectively inhibited. These results implied that HVAEF could not only inhibit the activities of metabolism-associated enzymes, but also prevent enzymatic browning, maintain nutritional quality, and delay starch degradation and reduce the accumulation of reducing sugars during cold storage. The current findings suggest that HVAEF is a promising technique for the preservation of quality in sweet potato roots during postharvest.