Effects of nitric oxide fumigation treatment on retarding cell wall degradation and delaying softening of winter jujube (*Ziziphus jujuba* Mill. cv. Dongzao) fruit during storage

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Postharvest Biology and Technology, Volume 156, October 2019, 110954

Abstract

Winter jujube (*Ziziphus jujuba* Mill. cv. Dongzao) fruit were fumigated with 20 μL L^{-1} of nitric oxide (NO) for 3 h and then stored at 0 ± 1 °C with 90–95 % relative humidity for 75 d. The effects of NO fumigation on changes in fruit firmness, activities of cell wall degrading enzymes, the compositions of the cell walls, as well as the cell wall ultrastructure in the winter jujube fruit were investigated during storage. The results showed that the decline in fruit firmness, contents of CDTA-soluble pectin (CSP), Na_2CO_3-soluble pectin (SSP), hemicellulose, and cellulose, as well as the increase in water-soluble pectin (WSP) of the winter jujube fruit could be delayed by NO treatment relative to the control. NO treatment also suppressed the activities of pectin methylesterase (PME; EC 3.1.1.11), polygalacturonase (PG; EC 3.2.1.15), β-galactosidase (β-Gal; EC 3.2.1.23) and cellulase (EC 3.2.1.4) during storage. Furthermore, ultrastructural observations revealed that NO treatment delayed the disruption of cell wall structure of the winter jujube fruit. These results indicated that retarding the disassembly of cell walls polysaccharides via inhibition of an array of cell wall degrading enzymes activities, which in turn would help maintain the intactness of the cell walls, might be one possible mechanism by which NO treatment can help prevent softening of the winter jujube fruit.