Shelf life extension of strawberry by temperatures conditioning, chitosan coating, modified atmosphere, and clay and silica nanocomposite packaging

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Abstract

In order to investigate the changes of gas inside the packaging as well as qualitative and mechanical properties of coated strawberry under modified atmosphere conditions, during the storage period, a study was conducted. First, the C_0S_0, $C_1S_{0.75}$ and $C_2S_{0.75}$ nanocomposite films were prepared using a molten mixture method (S and C represent nanosilica and nanoclay, respectively). Then, the strawberry was packed under modified atmosphere conditions (10% oxygen, 15% carbon dioxide and 75% nitrogen). Treatments included of two different temperature (4 °C and 25 °C), three levels the packaging (C_0S_0, $C_1S_{0.75}$ and $C_2S_{0.75}$) and two levels the coating (chitosan-coated and uncoated). The measurement parameters including chemical properties (pH, soluble solids content), physical properties (weight loss) and mechanical properties (firmness, elasticity modulus), as well as changes in the proportions of gases inside the package were evaluated and analyzed based on the Completely Randomized Multivariate Factorial (CRF) design. The results of variance analysis of weight loss, pH, soluble solids content, firmness, modulus of elasticity and changes in oxygen and carbon dioxide indicated that the main and interaction effects were significant at ($p < 0.05$). According to the SEM images, distribution of nanoparticles is almost uniform and there is no accumulation in various areas of the fracture surface. During the storage period, the variations of the dependent parameters at 4 °C were less than ones at 25 °C. Moreover, at two temperatures of 4 °C and 25 °C, the trend of variations of oxygen gas in the coated samples was different from the non-coated sample, so that it was slowing down until the second day and then increased. Finally, the results indicated that the coated sample packed with the $C_1S_{0.75}$ nanocomposite film had the most optimal mode in terms of the changes in physical, chemical and mechanical properties during the storage period.