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Effect of blanching and acidification as a pretreatment to minimize surface white discolouration of sliced carrots in pickles

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Pickled carrots which are dipped in a hygroscopic solution inside PET (Polyethylene terephthalate) pouches are susceptible to colour deterioration during storage. White appearance is considered as a result of either surface dehydration of outer layers or enzymatic activity or the formation of lignin as a response to wounding. Although heat treatment such as hot water blanching can minimize this defect they can lead to loss of sensory properties and nutritional properties in delicate pickled products which are fermented in a salty environment. Therefore an acidic environment can be provided along with the thermal treatment in order to reduce the temperature required for enzyme inactivation.

A study was carried out to determine the optimum blanching conditions which can maximize the retention of original colour of fresh carrots in the final pickled product. These blanching treatments were at 70 °C to 90 °C for 1 minute and 3 minutes and blanching mediums selected were 2% citric acid and water. At the end of three months of storage period at room temperature, lowest whiteness index and highest chroma value was obtained with the sample blanched at 70°C for 1 minute in 2% citric acid. The loss of bright orange colour due to carotene oxidation intensified the colour deterioration in pickled carrots. Decrease in β carotene content in carrots strongly correlated ($R^2=0.9918$) with decreasing chroma values. However blanching treatments carried out in an acidic environment yielded products with undesirable textural properties except for samples blanched at 70°C for 1 minute. Based on texture properties and colour properties samples treated at 70 °C for 1 minute in both acidic medium and in water and 90 °C for 1 minute in water and also the control sample were selected for further analysis. Antioxidant properties were affected by the thermal treatment and of the four treatments, the highest vitamin C content was reported with the unblanched sample; of the three blanching conditions selected maximum vitamin C content was retained in the sample blanched at 70°C for 1 minute in water and highest Ferric reducing antioxidant power and total phenolic content were obtained with the sample blanched at 70°C for 1 minute in citric acid. Therefore blanching at 70,°C in 2% citric acid for 1 minute is the most effective treatment condition which can prevent the enzymatic lignification and carotene degradation while retaining the antioxidant and sensory properties of pickled carrots.

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