Title Effect of osmotic dehydration on quality characteristics of frozen watermelon tissue

Author P.S. Taoukis, E.K. Dermesonlouoglou and M.C. Giannakourou

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Abstract

Watermelon processing prior to freezing is necessary due to its fragile textural integrity. One potential method is osmotic dehydration (OD) with carbohydrate solutions at mild temperatures to preserve product texture, flavor and other sensory properties. OD before freezing leads to reduction of freezable water and to additional functional properties due to the impregnated solutes. The objective of this work was to evaluate the effects of osmotic dehydration on quality and shelf-life of frozen watermelon tissue. Watermelon (cut in cylinders) were osmo-dehydrated (55% wt/wt of the selected carbohydrate and 1% wt/wt $CaCl_2$) for 45-60 min at 35 °C so as to obtain a 7% moisture content reduction. The osmotic solutes used were: fructose, oligofructose (RAFTILOSE®) and a high DE maltodextrin (GLUCIDEX47®). The mass ratio osmotic solution: fruit was 1:5. Osmo-dehydrated watermelon cylinders as well as untreated (unblanched and blanched at 80 °C for 80 sec) were subsequently frozen at -40°C and stored in isothermal freezers (from -3 to -20 °C). Soluble solids content (determined by refractometric index), water activity (aw) and sensory characteristics of treated and untreated samples were evaluated. Lycopene content (measured by HPLC), color (CIElab scale) and texture (TA-XT2i Analyzer) of all samples were kinetically studied and modeled during their subsequent frozen storage at different isothermal conditions. Immediately after the application of OD, the lycopene content as well as <<redness>> index (parameter a) of watermelon tissue was slightly increased. Taste and overall appearance of osmo-dehydrofrozen samples was judged as 'pleasant and organoleptically acceptable'. Pre-treated samples had firmer and crispier texture than the untreated. Osmo-dehydrofrozen samples exhibited significantly reduced rates of quality degradation compared to untreated ones at all storage temperatures studied. Shelf-life of pre-treated watermelon samples was more than doubled at -12 °C based on color and lycopene degradation. The results suggest that OD can improve frozen watermelon quality and stability during long-term frozen storage.