POSSIBILITES TO CONTROL SOLID UPTAKE DURING OSMOTIC DEHYDRATION OF CARROT SLICES IN SALT SOLUTIONS

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Abstract

The application of edible coatings as a barrier protects food products from microbiological, chemical and physical degradation, but they can also be used to increase the efficiency of some food processing processes. For example, edible coatings can reduce loss of colour, flavour and nutrients during processing and in that way improve the shelf-life of the product. Osmotic dehydration is a process of partial removal of water by bringing the plant material, most commonly, fruit or vegetables, into contact with a hypertonic (osmotic) solution. The removal of water is based on the non-destructive phenomenon of osmosis through the semipermeable membrane of the plant cell wall. The diffusion of water is accompanied by simultaneous counter diffusion of solutes from the osmotic solution into the tissue that can alter product quality. The major disadvantage of osmotic dehydration, which limits its application to food processing, is the diffusion of solute into the plant tissue.

The aim of this study is to investigate possibilities for control of solid gain during osmotic dehydration of carrot discs. Coating agents used in this study are carrageenan (2%), gelatine (2%), potato starch (3%), corn starch (3%) and maltodextrin (20% and 50%). Coating solutions were prepared with distilled water. Prepared samples were dipped in the aqueous coating solution. For carrageenan and gelatine coating dipping time was 30 s (at 30^{o}C), after that samples with carrageenan coating were dipped for 30 s into 2% calcium chloride solution used for gelling activation. For starch and maltodextrin solutions dipping time was 3 min at 70^{o}C. After dipping, samples were left on the aluminium sieve for 3 min to allow fixing of coatings. Starch and maltodextrin coatings, in order to solidify the coatings, were placed in the oven at 60^{o}C for either 10 or 30 min.

The dehydration efficiency index (DEI), stands for the water loss (WL) to solid gain (SG) ratio. As coating is aimed at limiting solid gain and promoting water loss, the DEI is an excellent way to evaluate different coating treatments as well as influence of process conditions. All coatings gave statistically higher values of dehydration index compared to non-coated (control) sample at the 5% level of significance. Higher values of DEI were obtained for samples that were dried for 30 min when compared with same coating type dried for 10 min. The difference is that edible coatings probably protect the surface of the samples from the rapid dehydration while they are dried, and in that way water loss values are higher for samples with coatings then for the non-coated samples dried for the same oven drying time. Maltodextrin coatings (50% and 30 min) had shown the best results in controlling solid uptake during osmotic dehydration of carrot slices. A significant improvement in DEI also is achieved with a lower concentration of maltodextrin (20%) with a longer coating time. Corn starch also provides satisfactory index values while other coatings, although leading to index improvements, are not as effective.

Key words: osmotic dehydration, edible coatings, dehydration efficiency index