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Preservation of carrot (*Daucus carota* L.) by osmotic dehydration

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ABSTRACT

Fresh carrots were preserved by the process of osmotic dehydration at a combination of salt and sucrose at various concentrations and soaking time. The combination of 65% sucrose + 10% NaCl concentrations gave the maximum water loss of 70.68% during osmosis. The osmosed samples were further dried under vacuum, fluidized condition and tray drying at 60° C. The rehydration characteristics and the quality of the osmotic dehydrated products in terms of it's β- carotene content was analysed. It was found that β- carotene content of osmo-vac samples was higher compared to fluidized bed and tray dried samples.

Key words : Carrot, Solutes, Osmotic dehydration, Rehydration, β-carotene.

Among vegetables, carrot is one of the richest sources of carotene. Carrot being an important root crop is cooked alone or with other vegetables in the preparation of soap, sweets, curries and pies. Tender carrots are pickled, dehydrated and preserved in many other ways. The process of osmotic dehydration is low energy requiring without loss of color, flavor and the textural quality. The osmo-dried products are dry enough to be shelf stable without additional need for refrigeration or thermal processing. (Bongirwar and Sreenivasan, 1977). The technique has been earlier applied successfully to papaya, banana, pineapple, and apple (Chaudhari *et al*., 1993; Jasim and Choudhary, 1995). In this study, osmotic dehydration was carried out for carrot using a combination of osmotic agents such as sucrose and salt and various drying methods.

MATERIALS AND METHODS

Preparation of the product :

Fresh carrots of uniform size were procured from local market. They were then washed, peeled and cut into slices of 3.5 mm thickness. The osmotic solute was prepared by blending the desired osmotic agent on w/w basis with distilled water. The carrot slices of known weight (250g) were soaked in osmosis solution. The contact time was varied from 1-18 h under static condition with a solution product ratio of 4:1.

Mass transfer during Osmosis :

During osmosis, there is a simultaneous counter current mass transfer of water from sample to concentrated solution and of solute from the concentrated solution into the sample. Water loss, solid gain and weight reduction for each sample were calculated by using the formulae below: (Mujumdar and Graboawski, 1991).

Water Loss (WL) is defined as the net water loss of the sample on initial mass basis.

$$WL = \frac{\text{Initial moisture} - \text{Final moisture}}{\text{Initial gross weight}} \times 100$$

Solid Gain (SG) is the net solid transported into the sample on initial mass basis.

$$SG = \frac{\text{Total solids} - \text{Initial solids}}{\text{Initial gross weight}} \times 100$$

Weight Reduction (WR) is the net mass loss of the sample on initial mass basis.

WR = Water Loss – Solid Gain.

Experimental Design :

Since earlier attempts were carried out using sucrose and sodium chloride individually, in this study, experiments were conducted at various combinations of sucrose and sodium chloride. The vessel was covered with aluminium foil to prevent evaporation from the free surface during osmosis. The samples were taken periodically from the solution and the surface moisture was removed using blotting paper.

Independent variables :

A. Osmosis solute concentration :

Sucrose and salt combination:

Sucrose and salt combination 45% sucrose + 5, 10, 15% sodium chloride