Osmotic Dehydration –
A Pre-treatment for Pineapple Drying

INTRODUCTION
Osmotic dehydration is widely used to remove part of the water content of fruit to obtain a product of intermediate moisture or as a pre-treatment (1). Osmotic dehydration is used as a pre-treatment for further drying to improve sensory, functional and even nutritional properties. The shelf life quality of the final product is better than without such treatment, due to the increase in sugar/solid ratio, the improvement in texture and the stability of the colour pigment during storage (2).

Vacuum impregnation is the application of a reduced pressure to a solid-liquid system, followed by restoration of the atmospheric pressure (3). Recently, osmotic dehydration at vacuum pressure has been studied, since a faster dehydration can be achieved with this treatment, as well as the controlled impregnation of active compounds into the material. An advantage of osmotic dehydration at vacuum pressures over atmospheric osmotic dehydration is that the solid-liquid interface area and the mass transfer between both phases can be increased (4).

Osmotic dehydration as a pre-treatment for further dehydration work was studied on South African grown Cayenne type pineapple. Osmotic dehydration was considered as a pre-treatment for pineapple with the final aim of obtaining high quality dried fruit products.

MATERIALS AND METHODS

Pineapple cylinders of 2 cm in diameter and 1 cm thick were cut using a cork borer (Figure 1). The pieces were immersed in sucrose solutions of 45, 55 and 65 °Brix at 30, 40 and 50°C for 20, 40, 60, 120, 180 and 240 minutes. Experiments were conducted at both atmospheric pressure (OD) and applying a 200 mbar vacuum pulse (PVOD) during the first 10 minutes.

Analyses
• Three of the samples were marked so that the same samples were monitored for weight change throughout the process.
• The moisture content was determined using the oven drying method described in AOAC, Method 934.06.
• The soluble solids were measured by refractometry.
• The change in weight (\(\Delta M_t\)), the solutes/sugar gain (\(\Delta M_{ss}\)) and the water loss (\(\Delta M_w\)) were calculated from simple mass balances:

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\begin{align*}
\Delta M_t &= M_f - M_t \\
\Delta M_{ss} &= M_{ssf} - M_{sst} \\
\Delta M_w &= M_{wfs} - M_{wst}
\end{align*}
\]

Where:
- \(M_f\) = initial weight (g)
- \(M_t\) = weight at time t (g)
- \(M_{ssf}\) = initial mass fraction of water (g/g)
- \(M_{sst}\) = mass fraction of soluble solutes (g/g)
- \(M_{wfs}\) = mass fraction of water at time t (g/g)
- \(M_{wst}\) = mass fraction of soluble solutes at time t (g/g)

The data were analysed with an ANOVA multifactorial design in StatGraphics (StatPoint Inc., Herndon, VI, USA).

RESULTS AND DISCUSSION

Water loss increased mostly by increasing temperature and was less sensitive to changes in the concentration of the solution. Solids gain increased mostly with concentration, being less sensitive to temperature.

CONCLUSIONS
The yield of the process was improved by applying a vacuum pulse, since mass loss was less in those cases. It also facilitated the process of solids gain, especially at the higher concentration and temperature.

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ACKNOWLEDGEMENT
The authors thank the European Commission for their financial support of this project (NCO-DE151A-2001-02047).

REFERENCES