

## ABSTRACT

Infrared dehydration and effects of operating conditions on quality of dried fruits were studied on blueberries.

O'Neal, Misty, Reveille, Georgia Gem and Blue Cuinex varieties of blueberries, grown in Salto Grande region (Argentina Republic), were dried immediately after harvesting in a far infrared dryer, with a power of 400 W and an air velocity of 0.3 m / s.

Process variables were fruit solid content (10-12 °Brix), concentration (0-0,75- 1,5 %) and immersion time (0-15-30 seconds) of soda solution used for skin treatment, and drying temperature (105-110-115 °C). Observed variables were anthocyanins retention, firmness of the dried fruits and drying time.

It was found that the growth of molds in dried blueberries requires a minimum water activity of 0.89. A safety margin prolonging drying cycles until reaching water activities in the range from 0.77 to 0.80 (which corresponds to 0.45 to 0.59 g water per g of dry matter) was taken.

We have obtained the equilibrium moisture isotherms at 25, 45 and 105 °C, which fit with high correlation to the model described by Guggenheim-Anderson-de Boer (GAB). Effective diffusivity of humidity was also calculated, obtaining values of 6.54, 7.27 and 7.75 x 10<sup>-10</sup> m<sup>2</sup>/s for temperatures of 105, 110 and 115 °C respectively.

The activation energy calculated by the Arrhenius equation from the average effective diffusivity was 20.73 kJ / mol, and 34.30 kJ / mol when calculated from the parameter K (min<sup>-1</sup>) of the Page equation.

It was found that the temperature in the center of a blueberry rises faster with infrared drying than in hot air at the same temperature. After 60 minutes of drying at 105 °C, respective temperatures of 105 °C and 67 °C were reached.

Blueberry firmness tended to rise as drying proceeded, but it did very slowly when the moisture of the fruit remained above 0.35 (dry basis). It is not necessary to achieve this level of residual moisture but, even in this case, firmness would achieve

values of about 1.5 N, far from the value of 2 N considered as a limit for the sensory acceptance of dried blueberries.

In the screening experiences, aimed at selecting the main process variables, the immersion of the blueberry fruits in soda solutions was ineffective to improve the drying times, to increase anthocyanin retention or to decrease firmness of dried fruits. It has also been found that temperatures of 120 °C (or higher) produce cracks in the skin of dried blueberries.

The multicriteria optimization by the desirability function, which includes drying time, anthocyanins retention and firmness, recommends to use blueberries of 10 °Brix and a drying temperature of 113.7 °C, without any pretreatment by immersion in soda solutions; in such conditions anthocyanins retention of 53.55 %, firmness of 0.52 N and drying time of 91.5 minutes could be achieved. If drying time is not included in the criterion, the drying temperature should be 105 °C and, under this condition, anthocyanin retention would reach a 60 % and firmness 0.77 N, but drying time should be increased until 114 minutes.