

## Kinetics of Sugar Losses in Hot Water Blanching of Water Yam (*Dioscorea alata*)

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**Abstract :** Yam is majorly a carbohydrate food grown in most parts of the world. It could be boiled, fried or roasted for consumption in a variety of ways. Blanching is an established heat pre-treatment given to fruits and vegetables prior to further processing such as dehydration, canning, freezing etc. Losses of soluble solids during blanching has been a great problem because a reasonable quantity of the water-soluble nutrients are inevitably leached into the blanching water. Without blanching, the high residual levels of reducing sugars after extended storage produce a dark, bitter-tasting product because of the Maillard reactions of reducing sugars at frying temperature. Measurement and prediction of such losses are necessary for economic efficiency in production and to establish the level of effluent treatment of the blanching water. This paper aims at resolving this problem by investigating the effects of cube size and temperature on the rate of diffusional losses of reducing sugars and total sugars during hot water blanching of water-yam. The study was carried out using four temperature levels (65, 70, 80 and 90 °C) and two cubes sizes (0.02 m<sup>3</sup> and 0.03 m<sup>3</sup>) at 4 times intervals (5, 10, 15 and 20 mins) respectively. Obtained data were fitted into Fick's non-steady equation from which diffusion coefficients (Da) were obtained. The Da values were subsequently fitted into Arrhenius plot to obtain activation energies (Ea-values) for diffusional losses. The diffusion co-efficient were independent of cube size and time but highly temperature dependent. The diffusion coefficients were  $\geq 1.0 \times 10^{-9} \text{ m}^2\text{s}^{-1}$  for reducing sugars and  $\geq 5.0 \times 10^{-9} \text{ m}^2\text{s}^{-1}$  for total sugars. The Ea values ranged between 68.2 to 73.9 KJmol<sup>-1</sup> and 7.2 to 14.30 KJmol<sup>-1</sup> for reducing sugars and total sugars losses respectively. Predictive equations for estimating amount of reducing sugars and total sugars with blanching time of water-yam at various temperatures were also presented. The equation could be valuable in process design and optimization. However, amount of other soluble solids that might have leached into the water along with reducing and total sugars during blanching was not investigated in the study.

**Keywords :** blanching, kinetics, sugar losses, water yam

**Conference Title :** ICFPE 2019 : International Conference on Food Process Engineering

**Conference Location :** Montreal, Canada

**Conference Dates :** May 23-24, 2019