

# Rate of browning reaction during preparation of coconut and palm sugar

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Available online 7 February 2003.

## Abstract

The objective of this research was to analyse the rate of browning reaction during preparation of palm and coconut sugar. Brown colour formation during preparation of coconut sugar at a laboratory scale followed a zero order reaction with a constant of formation ( $k$ ) equal to  $5.15 \times 10^{-3}$  AU min<sup>-1</sup> (AU=Absorbance Unit). The amount of glucose, fructose and sucrose decreased during this preparation and the decrease followed a zero order reaction for glucose, first order for fructose, whereas that for sucrose followed neither zero nor first order reaction. After 90 min boiling (when the coconut sugar was formed), the amounts of glucose, fructose and sucrose left were 27.7%, 35.7% and 83.7% of the initial amount, respectively. The relative percentage area of furans and pyrazines increased during the preparation of coconut sugar and this increase followed a first order reaction for both.

The palm sap with initial pH adjusted to 8.0 was heated in a closed system at temperatures of 105, 115 and 121 °C for up to 300 min and every 30 min, the brown colour of the sap was measured at 420 nm. The brown colour formation followed a zero order reaction with  $k$  equal to  $0.87 \times 10^{-3}$ ,  $4.46 \times 10^{-3}$ ,  $6.58 \times 10^{-3}$  AU min<sup>-1</sup> for reaction temperatures of 105, 115 and 121 °C, respectively. The activation energy of the brown colour formation was 160.77 J mol<sup>-1</sup>. In a separate experiment, an aqueous solution containing glucose, fructose and sucrose at a concentration of 3.42%, 1.56% and 7.22%, respectively, with and without addition of 0.01% L-lysine, each was adjusted to pH 8.0 and heated at 121 °C and analysed as above. The rate of brown colour formation that resulted from heating model aqueous solution containing sugars and L-lysine resembled that resulting from heating palm sap. Therefore, the Maillard reaction plays an important role in the formation of brown colour during preparation of palm sugar.

**Author Keywords:** Palm sugar; Coconut sugar; Browning rate