

Rheological Properties of Red Beet Root Juice Squeezed from Ultrasonicated Red Beet Root Slices

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Abstract : Ultrasound technology is the one of the non-thermal food processing method in recent years which has been used widely in the food industry. Ultrasound application in the food industry is divided into two groups: low and high intensity ultrasound application. While low intensity ultrasound is used to obtain information about physicochemical properties of foods, high intensity ultrasound is used to extract bioactive components and to inactivate microorganisms and enzymes. In this study, the ultrasound pre-treatment at a constant power (1500 W) and fixed frequency (20 kHz) was applied to the red beetroot slices having the dimension of 25×25×50 mm at the constant temperature (25°C) for different application times (0, 5, 10, 15 and 20 min). The red beet root slices pretreated with ultrasonication was squeezed immediately. The changes on rheological properties of red beet root juice depending on ultrasonication duration applied to slices were investigated. Rheological measurements were conducted by using Brookfield viscometer (LVDV-II Pro, USA). Shear stress-shear rate data was obtained from experimental measurements for 0-200 rpm range by using spindle 18. Rheological properties of juice were determined by fitting this data to some rheological models (Newtonian, Bingham, Power Law, Herschel Bulkley). It was investigated that the best model was Power Law model for both untreated red beet root juice ($R^2=0.991$, $\chi^2=0.0007$, $RMSE=0.0247$) and red beetroot juice produced from ultrasonicated slices ($R^2=0.993$, $\chi^2=0.0006$, $RMSE=0.0216$ for 20 min pre-treatment). k (consistency coefficient) and n (flow behavior index) values of red beetroot juices were not affected from the duration of ultrasonication applied to the slices. Ultrasound treatment does not result in any changes on the rheological properties of red beetroot juice. This can be explained by lack of ability to homogenize of the intensity of applied ultrasound.

Keywords : ultrasonication, rheology, red beet root slice, juice

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