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# Direct Contact Ultrasound Assisted Drying of Mango Slices

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**Abstract :** There is undoubted proof that increasing the intake of fruit lessens the risk of hypertension, coronary heart disease, stroke, and probable evidence that lowers the risk of cancer. Proper fruit drying is an excellent alternative to make their shelf-life longer, commercialization easier, and ready-to-eat healthy products or ingredients. The conventional way of drying is by hot air forced convection. However, this process step often requires a very long residence time; furthermore, it is highly energy consuming and detrimental to the product quality. Nowadays, power ultrasound (US) technic has been considered as an emerging and promising technology for industrial food processing. Most of published works dealing with drying food assisted by US have studied the effect of ultrasonic pre-treatment prior to air-drying on food and the airborne US conditions during dehydration. In this work a new approach was tested taking in to account drying time and two quality parameters of mango slices dehydrated by convection assisted by 20 KHz power US applied directly using a holed plate as product support and sound transmitting surface. During the drying of mango (Mangifera indica L.) slices (ca. 6.5 g, 0.006 m height and 0.040 m diameter), their weight was recorded every hour until final moisture content (10.0±1.0 % wet basis) was reached. After previous tests, optimization of three drying parameters - frequencies (2, 5 and 8 minutes each half-hour), air temperature (50-55-60$^0$C) and power (45-70-95W)- was attempted by using a Box–Behnken design under the response surface methodology for the optimal drying time, color parameters and rehydration rate of dried samples. Assays involved 17 experiments, including a quintuplicate of the central point. Dried samples with and without US application were packed in individual high barrier plastic bags under vacuum, and then stored in the dark at 8$^0$C until their analysis. All drying assays and sample analysis were performed in triplicate. US drying experimental data were fitted with nine models, among which the Verna model resulted in the best fit with $R2 > 0.9999$ and reduced $\chi 2 \leq 0.000001$. Significant reductions in drying time were observed for the assays that used lower frequency and high US power. At 55$^0$C, 95 watts and 2 min/30 min of sonication, 10% moisture content was reached in 211 min, as compared with 320 min for the same test without the use of US (blank). Rehydration rates (RR), defined as the ratio of rehydrated sample weight to that of dry sample and measured, was also larger than those of blanks and, in general, the higher the US power, the greater the RR. The direct contact and intermittent US treatment of mango slices used in this work improve drying rates and dried fruit rehydration ability. This technique can thus be used to reduce energy processing costs and the greenhouse gas emissions of fruit dehydration.

**Keywords :** ultrasonic assisted drying, fruit drying, mango slices, contact ultrasonic drying
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