
Ultrasound-assisted hot air drying for improving drying kinetics and preserving amylolytic activity in malted cereals

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Although conventional hot air drying is a consolidated technology worldwide, it is still considered an energy-consuming process in food applications. These characteristics play an important role in processes that are already time-consuming, such as malting. In this sense, the present study aimed at applying ultrasound (US) in assistance to hot air drying to accelerate drying kinetics of post-sprouted wheat and barley grains and to preserve their resulting amylolytic properties. For this, post-sprouted wheat and barley were subjected to conventional hot air drying and to US-assisted hot air drying, both at 50 °C. Drying kinetics were evaluated and the alpha- and beta-amylase activity of the produced radicleless malts was determined. Both cereals took ~55% less time to reach a moisture content of 10% (d.b.). The Page model was able to accurately described the drying curves with a $R^2_{adj} > 0.98$ and a $RMSE < 0.3$. Drying rates were improved by 129% and 98% in the case of wheat and barley, respectively. Alpha-amylase activity showed higher values for US-assisted dried malts (88% and 39% for wheat and barley, respectively) compared to conventionally dried ones. In regards to the beta-amylase activity, wheat dried by the US-assisted process showed 10% higher values when compared to conventionally dried ones. Beta-amylase activity of barley remained constant unchanged. Besides an improvement in the process kinetics, such results indicate the potential application of to improve the starch saccharification capacity of the resulting wheat malt, by means of both dextrin formation as well as maltose units' release. On the other, barley dried with the assistance of US had higher capacity to promote dextrin release compared to conventionally dried malts. The different characteristics of the resulted products can be used and combined to improve a given food application, such as brewery or baking, for example.