Ultrasound-assisted hydration as an approach to accelerate and enhance amylase development during corn malting process

Maria Julia Neves Martins [1], Márcio Augusto Ribeiro Sanches [1], Tiago Carregari Polachini [1], Javier Telis-Romero [1]

[1] São Paulo State University (Unesp), Institute of Bioscience, Humanities and Exact Sciences (Ibilce), Campus São José do Rio Preto, 15054-000 Brazil

Abstract: As a consequence of the growing use of wheat and barley malt in food processes, there is an existing trend by studying alternative malted cereals. Corn malt is an emerging cereal that can be used as a clean-label source of enzymes for brewery, spirits and baking application. However, the conventional hydration process of corn is a hindrance as it usually takes more time than other common cereals, which makes the enzyme development slower. In this sense, ultrasound is reported to have a positive impact in the water uptake kinetics. On the other hand, it has not been investigate how it affects the amylase expression during germination. Thus, this work aimed at studying the corn (*Zea mays* L.) germination process in which concerns the changes in its amylase activity. The grains were subjected to ultrasound-assisted hydration (500, 700 and 1000 W) for 12 hours at 20 ºC to raise their moisture content from 98.97 to ~42%. Then, corn samples were put to germinate at 15 ºC in an incubating chamber for 88 hours at 15 °C, with water replacement after each 16 hours. Every 8 h of germination, samples were rapidly frozen and, subsequently, freeze-dried. Dried samples of partially-germinated corn were ground and had their alpha- and beta-amylase determined. It was noticed that more significant changes started to appear in both alpha- and beta-amylase after 16 h of germination, with higher values for samples treated with 700 and 100 W followed by 500 W and control. This trend remained up to the end of germination with no significant differences for both amylases. At the end of the germination, alpha-amylase activity was able to reach similar higher activity at the two highest power levels (0.115-0.125 U/mg) compared to the control and 500 W-treated samples (0.09-0.11 U/mg). Beta-amylase values behaved similarly to alpha-amylase, but the maximum activity was reached earlier (64 h) for samples treated with 700 and 1000 W, compared to the control and 500 W-treated ones (88 h). In other words, ultrasound-assisted hydration was able to accelerate alpha-amylase development by up to 55% while 28% for beta-amylase. Therefore, ultrasound-assisted hydration can be used to increase the potential application of corn malt by accelerating and enhancing the corn malting process.

Keywords: cereal; enzymes; soaking; sprouting; food ingredient; brewery.