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Title:

Influence of ultrasound-assisted par-frying on crust formation and browning during the production of French fries

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Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

Frying is a key processing step during the production of French fries and important for end product quality and sensory attributes. It is governed by heat and mass transfer between the frying oil and the potato strips. Crust and color of the French fries are key quality parameters and important in consumer perception. Crust formation is a result of combined heat and mass transfer effects. Convective heat transfer from frying oil to potato strips and heat conduction within the tissue cause water evaporation. Mass transfer occurs in the form of water vapor release to the frying oil and oil absorption in the outer layers of the potato strips. Browning of French fries is related to Maillard reactions between reducing sugars and amino acids. High contents of reducing sugars are often related to an undesired dark color and bitter taste of French fries.

High-intensity ultrasound transmitted to liquid media causes cavitation and micro-streaming, which can influence boundary layers and cell structures and result in improved heat and mass transfer.

The influence of an ultrasound treatment of potato strips during the par-frying step was investigated in order to determine the effect on the resulting changes in product quality. Improved heat transfer at the product surface due to micro-streaming in the oil and a facilitated release of vapor from the product surface was observed. A faster crust formation was found at the initial phase of frying but the crust was found to become softer at longer sonication times due to persistent mechanical ultrasound effects. French fries from ultrasound assisted par-frying had a lighter color after finish-frying in comparison to the conventionally par-fried samples due to an improved release of reducing sugars from the tissue.

Ultrasound-assisted par-frying showed to be effective in modifying heat and mass transfer with an impact on crust formation and browning of French fries. Further work is required regarding the optimization of parameters and sonication times.