

Effect of ultrasound treated food ingredients as phosphate replacers in Irish breakfast sausages

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Introduction: Power Ultrasound technology is the one of the recent food processing technologies that has gained interest among the food industries. Ultrasound treatment on food ingredients can improve their techno-functional properties and helps in their effective distribution into the food matrix. Studies show that the water retention and oil retention properties of meat and dairy ingredients can be enhanced using the ultrasound treatment (Téllez-Morales et al. 2020). Consumer interests on high quality and clean label meat products has forced the meat industries to employ both these emerging food processing technologies and natural food ingredients. This has resulted in interest towards the removal of phosphate stabilisers, added in processed meat products for their improved water holding, emulsion stability properties (Nguyen et al. 2011), using natural food ingredients. Apple pomace (AP) and coffee silver skin (CSS) are the two fibre-rich food co-product ingredients that has the potential to reduce the phosphate content added in Irish breakfast sausages (Thangavelu et al. 2019). Hence, the objective of this study is to treat the ingredients AP and CSS with power ultrasound technology and to compare their phosphate replacing ability in Irish breakfast sausages after the ultrasound treatment.

Methods & materials: The phosphate reducers, apple pomace and coffee silver skin solutions (10% w/v), are treated separately with power ultrasound technology for 30 minutes, freeze-dried and the powdered ingredients are then stored at 4 °C. Three Pork loins (pH > 5.5) per replication were purchased (Gleeson Butchers, Ireland). All sausage formulations (1.5 kg) were made containing lean pork meat (58%), pork back fat (20.35%), water/ice (13.45%), rusk (5.75%) and seasoning (1.45%) along with the ingredient mixture (1%). The ingredient mixture combinations included sodium tripolyphosphate (STPP), AP and CSS. Three different combinations (based on previous works) were studied with both untreated (Control) and US treated AP and CSS.

(i) 0.2 % STPP + 0.22% AP + 0.58% CSS

(ii) 0.2 % STPP + 0 % AP + 0.8 % CSS

(iii) 0.06 % STPP + 0.94 % AP + 0 % CSS

The ingredients were mixed together and stuffed inside the collagen casing using the meat mincer (Meat Grinder MG510, Kenwood, UK) fitted with sausage filler. The sausages were then packed in a retail tray with cling film and stored at 4 °C. The sausages were then analysed in the following days for their water holding capacity (WHC), emulsion stability, cook loss, texture profile analysis (TPA), lipid oxidation and proximate content. Results of the analyses were used to compare the effect of phosphate replacing ability of ultrasound treated ingredients with the untreated (control) ingredients.

Results: Phosphates are responsible for maintaining the water holding capacity, cook loss and emulsion stability of the sausages. Results of this study has shown that the usage of US treated ingredients has significantly improved water holding capacity (81-85%) and decreased cooking loss (8-9%) when compared with that of the formulations with untreated ingredients (WHC - 76-82%; cook loss - 9-12%). Results of emulsion stability shows that the ultrasound treated ingredients has decreased values of TEF (%) and fat exudate (%) for the third formulation whereas no significant results were obtained for other two formulations. No significant changes were observed in the proximate content of all three formulations of sausages irrespective of the ultrasound treatment. No significant difference in texture characteristics was observed between the formulations with US treated and untreated ingredients. However, TBARs results of sausage with US treated ingredients had higher MDA values.

Conclusions: This study has shown that the usage of ultrasound treated ingredients in Irish breakfast sausage has showed improved technological properties, with improved WHC and decreased cook loss; without affecting textural properties.

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References:

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