Phosphate Elimination in Emulsified Meat Products: Impact of different Proteins on Quality Characteristics

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Introduction: Food phosphates fulfill several techno-functional properties in meat products, resulting in optimal emulsifying and gelling properties of meat proteins, in turn enhancing water holding capacity, fat stabilization and structure formation. Nevertheless, the market trend towards additive-free products and the negative effect of phosphates on the health of certain population groups, challenge the industry to develop phosphate-free meat products. The aim of this study was to evaluate the potential of 7 protein-based ingredients (pea, blood plasma, gelatin, soy, whey, egg white and potato protein) to remediate the negative effects of phosphate elimination in emulsified meat products.

Material and methods: Firstly intrinsic protein functionalities related to improving quality of meat products (gelling capacity through dynamic rheological measurements, emulsifying capacity through emulsion turbidity assessments) were evaluated in a 0.05M phosphate buffer (pH 6) containing 3.5% salt. Secondly the ability of proteins to improve quality of phosphate-free cooked sausages was evaluated in comparison to phosphate-containing and phosphate-free reference products. Hereby several quality characteristics during sausage production (viscoelastic behavior and emulsion stability of the batter) and of the final product (textural properties, cooking loss and pH of the sausage) were studied.

Results: Potato and egg white protein had good intrinsic gelling properties. The latter also showed promising intrinsic emulsifying characteristics, as did blood plasma, gelatin and whey protein. The intrinsic characteristics of several proteins therefore indicated a promising potential to enhance quality of meat products.

Phosphate elimination had a negative impact on cooked sausage quality. Next to an increase in cooking loss and reduced emulsion stability, a change in gel network formation during thermal processing could be observed.

Blood plasma and soy showed the best results in phosphate-free cooked sausages as no significant differences in terms of product hardness, cooking yield and emulsion stability could be found compared to standard phosphate containing sausages. Furthermore the addition of egg, pea, potato and whey proteins each had their advantages and disadvantages regarding product stability and hardness. Gelatin could not improve cooking loss and significantly increased hardness of the sausages compared to phosphate-free sausages.

Conclusions: Addition of proteins from either animal or vegetable source, such as blood plasma and soy, could compensate for the quality loss due to phosphate elimination in meat products. Measurement of the intrinsic characteristics (gelling and emulsification) of the proteins provided useful information but the impact of the proteins in a meat matrix was somewhat different. This indicated the importance of a well-defined standardized meat matrix to fully understand the application potential of alternative proteins in meat products.

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