

Combined effect of phosphate replacer and starches on quality and consumer acceptability of low fat pork bologna (#153)

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Introduction

The demand for clean label meat products has been fueled by overarching consumer concerns regarding health and wellness as well as the impact of diet on overall wellbeing. While the concept of clean label may vary across consumers, it seems to encompass, among other things, recognizable ingredients, minimally processed and natural products that contain no added preservatives or additives (Asioli et al., 2017). However, given the functional properties of some meat processing ingredients, finding a replacement that meets consumers' criteria of clean label without sacrificing functionality can be challenging.

Phosphates are one of such ingredients that have been widely used in varying meat products due to their unique ability to improve water holding capacity, enhance protein binding functionality and flavour stability (Long, Gál, & Buňka, 2011). Concerns regarding their adverse health effect has positioned this ingredient under increasing scrutiny (Ritz, Hahn, Ketteler, Kuhlmann, & Mann, 2012). The purpose of this study was to examine the effect of a phosphate replacer and starches, and the combination of both on overall quality and consumer acceptability of low-fat pork bologna.

Methods

Seven different bologna formulations were manufactured: Control (C; no binders), 0.3% sodium tripolyphosphate (STPP), 0.75% phosphate replacer; a yeast/citrus extract based ingredient (PHR; PROSUR® Wenda Ingredients, Naperville, IL, USA), 3% potato starch (POTS), 3% pea starch (PEAS) and combinations of 0.75% PHR with either 3% potato (PHR+POTS) or pea starch (PHR+PEAS). Pork trim and pork back fat were separately ground through a 3 mm plate. The required quantities of ground pork, ground pork fat, spices, ice/water, and binders were combined and mixed at high speed under vacuum (-0.8 bar) in a bowl cutter. The mixture was then stuffed into moisture proof casings (105 mm diameter) and the bologna sausages were thermally processed in a smokehouse to an internal temperature of 71°C.

Evaluation of pH, cook yield, expressible moisture (EM), purge loss, colour as well as textural profile analysis were carried out according to previously reported procedure (Pietrasik, Gaudette, & Johnston, 2017). Consumer (N=121) acceptance of bologna appearance, flavour, texture, juiciness, firmness, aftertaste and overall acceptability was evaluated using 9-point hedonic scales. Data were subject to analysis of variance using the General Linear Model procedure of SAS. Tukey test was used for means separation where

treatment effect was significant ($p < 0.05$).

Results

The cooking yield was lowest in the bolognas without any binders and there were no significant differences ($p > 0.05$) in cook yield amongst other formulations suggesting that phosphate replacer and both starches added alone or in combination resulted in a cook yield equivalent to the STPP treatment. PHR inclusion resulted in significantly ($p < 0.01$) higher pH in bologna compared to all other treatments which could potentially impact bologna's water holding capacity. Surprisingly, EM for PHR formulations were not different from control and PEAS samples, and were higher than other formulations. While the addition of POTS improved the EM of bologna, PEAS did not have the same impact. On the other hand, PEAS and PHR reduced the purge loss in bologna up to the level of STTP. POTS resulted in significantly less purge than STPP. Moreover, the combination of PHR + POTS provided the greatest purge control and resulted in 50% reduction of purge loss compared to control treatment.

PHR bologna was the least hard and chewy, while addition of 3% pea starch or potato starch produced the firmest texture. Similar to previous studies (Shand, 2000), inclusion of potato starch contributed to the highest cohesiveness, springiness and chewiness among all cooked bologna sausage treatments. Combining PHR with either starches resulted in a significant decrease in firmness and chewiness of bolognas to the level equivalent with STPP treatment. The incorporation of STPP, PHR or POTS did not have any significant impact on the colour characteristics of final products. However, the presence of pea starch produced an increase in yellowness and a decrease in redness compared to all other treatments.

Overall, there were no statistical differences ($p > 0.05$) in the mean liking scores for overall acceptability and the acceptability of flavour when comparing POT, PHR+POTS and control to the industry standard STPP treatment. PHR and PEAS treatments on their own and in combination (PHR+PEAS) were generally liked less ($p < 0.05$) than the STPP treatment for all attributes. While the formulations containing PHR had the lowest liking score for texture, juiciness and firmness, the addition of POTS to these formulations enhanced the liking scores for these attributes to the level comparable to the industry standard STPP.

Conclusion

In the presentation of bologna, when used as a binder, POTS on its own or in

combination with PHR, provided similar overall eating experience as well as processing quality when compared to industry standard STPP binder. PHR and PEAS on their own or in combination resulted in products with lower consumer acceptability.

Notes