Published February 1, 2019

2017 Reciprocal Meat Conference – Meat and Poultry Processing, Ingredient Technology and Packaging

Meat and Muscle Biology™

Impact of Chlorophyll a on the Color of Pre-Rigor Ground Pork Stored in Simulated Retail Display

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Keywords: chlorophyll, color, green tea extract, pork, rosemary extract
Meat and Muscle Biology 1(3):44 **doi:10.221751/rmc2017.041**

Objectives

The impact of the photosensitizer chlorophyll *a* (chl *a*) was examined in 3 independent pre-rigor pork sausage experiments. The objective was to determine the threshold level of chl α that accelerated color loss, and to ascertain whether synthetic antioxidants, natural plant extracts, or a combination of both would help delay color loss.

Materials and Methods

In each experiment, 3% water and 0.8% salt were added to pre-rigor pork trim (6 h post-mortem). In experiment 1, different levels of parsley (0, 513, 1026, 2051, and 3077 ppm) were added to the pork, equivalent to 500, 1000, 2000, and 3000 ppb chl *a*. Chl α was measured by UV-Vis spectrophotometer. In experiment 2, each batch of meat was treated with 0.3% FORTIUM RGT12 Plus Dry (rosemary and green tea extracts). The 3 treatment conditions were no added sage, 0.0075% oleoresin sage, and 0.15% rubbed sage, to study the impact of chl *a* delivered by sage used in breakfast sausage. In experiment 3, 1539 ppm of ground parsley (1500 ppb chl *a*) was added to each batch of meat, and the treatments were untreated, a synthetic antioxidant blend [0.01% butylated hydroxyanisole (BHA), 0.01% propyl gallate (PG), and 0.01% citric acid (CA)], 0.3% FORTIUM RGT12 Plus Dry (RGT), and 0.3% RGT plus BHA/PG/CA. All of the treatments were replicated ($n = 2$). The treatments were mixed with the pork for 1 min, ground through a 4.8 mm plate, and shaped into 150 g patties. The patties were placed on foam trays and covered with oxygen permeable overwrap. They were frozen for 11 d (–18°C) followed by 12 to 17 d of simulated retail display (3 ± 1°C, 1,200 to1,400 lux fluorescent lighting). Instrumental redness (a^*) and photographs were taken periodically during the lighted display period to monitor changes.

Results

The results revealed significant effects of time and treatment ($p < 0.05$) for each experiment. In experiment 1, the patties with 2000 and 3000 ppb chl *a* had lower a^* values ($p < 0.05$) than the 0, 500 ppb, and 1000 ppb chl *a* treatments. The 1,000 ppb chl *a* patties had lower a^* values ($p < 0.05$) than the 500 ppb patties, and there was no significant difference between the mean a^* values of the 500 ppb patties and the patties with no added parsley. In experiment 2, the patties with rubbed sage (778 ppb chl *a*) had lower a^* values ($p < 0.05$) than the patties with no sage or oleoresin sage, and there was no significant difference between the mean a^* values of the patties with no sage and oleoresin sage (36 ppb chl *a*). In experiment 3, the patties demonstrated color instability when chl *a* was present at 1500 ppb, even in the presence of natural plant extract and antioxidant ingredients. RGT and RGT + BHA/PG/CA had higher a^* values than untreated ($p < 0.05$), while BHA/PG/CA a^* values were not higher than untreated ($p > 0.05$). RGT a^* values were neither significantly higher than BHA/PG/CA nor significantly lower than RGT + BHA/PG/CA ($p > 0.05$).

Conclusion

This study suggested that pre-rigor pork sausage color stability was moderately affected by chl *a* levels between 500 and 1000 ppb, and it was significantly affected when chl *a* exceeded 1000 ppb. Although minimizing chl *a* in seasoning blends and limiting light exposure could help extend color life, the use of 0.3% FORTIUM RGT12 Plus Dry extended the simulated retail color life of pre-rigor ground pork containing the level of chl *a* typically found in commercial seasonings.

