P-04-09

Prevention of lipid oxidation during storage of cured raw hams by starter cultures (#294)

Ramona Bosse[1], Monika Gibis[2], Julia Freese[2], Jochen Weiss[2], This project AiF 17687N was supported via AiF within the program for promoting the Industrial Collective Research of the German Ministry of Economics and Energy and conducted at the University of Hohenheim, Germany.

[1] University of Applied Sciences Bremerhaven, Food Technology for Products of Animal Origin, Bremerhaven, Germany; [2] University of Hohenheim, Department of Food Physics and Meat Science, Stuttgart, Germany

Introduction

In general, cured meat products such as raw hams have a long tradition and convincing with fine aromatic taste and typical reddish appearance. As the manufacturing process of cured raw hams remains one of the most time-consuming ones in meat industry, someone wonders why starter cultures are not used to improve and maintain food quality attributes. As most raw hams are sold as sliced products in Germany, the objective of this study was to investigate the effect of *Staphylococcus carnosus* on lipid oxidation during storage of sliced raw hams.

Methods

For this study, coagulase-negative *Staphylococcuscarnosus* strains were selected by metabolic activities (Tab. 1). Pork loins (*M. longissimus dorsi*) were manufactured by injecting brine without or with starter culture (7 log cfu/mL brine) in combination with dry-curing, cold smoking and ripening (4% salt; five weeks). Overall, four batches were investigated, control without starter culture with nitrite or nitrate and inoculated hams with nitrate cure including *S. carnosus* LTH 3838 or *S. carnosus* LTH 7036. The storage experiment was carried out (3 slices; thickness: 50mm) at 5°C for 12 days under light with residual air (light + air) and under vacuum (light + vacuum) or in the dark with air (dark+ air) and under vacuum (dark + vacuum). For total viable count diluted samples were pour or spiral plated on plate count agar (48h, 37°C). Investigation of raw hams on nitrate/ nitrite content were carried out via HPLC. For studying the lipid oxidation hexanal as key marker was measured by GC-FID system with a trap headspace sampler (PERKIN ELMER, GERMANY) (Bosse et al., 2016; doi: 10.1016/j.foodchem.2016.09.094). Statistical analysis was executed with STATGRAPHICS (α=0.05; STATPOINT, USA; Granato et al.; 2014; doi: 10.1016/j.foodres.2013.10.024).Table 1: Metabolic properties of selected *Staphylococcus carnosus* strains (Müller et al., 2016; doi: 10.1007/s13213-015-1133-y).

Strain	Origin	Net growth up to NaCl concentration (g/L)		Lypolysis
S. carnosus LTH 3838	fermented fish	150	0.04	positive
S. carnosus LTH 7036	fermented meat	70	0.72	positive

Nitrate reduction (mol NO_2 per 7 log cfu)

Results

Starter cultures remain viable during five weeks of manufacturing and ripening ham batches (total viable counts 6 log cfu/g raw ham). Whereas, the total viable counts of nitrite control hams remained at 4 log cfu/g raw ham and nitrate control hams increased up to 6 log cfu/g raw ham. In addition, the nitrate content (week 5) in hams cured with nitrite or nitrate inoculated with strain LTH 7036 were low with 52.06 ± 5.2 mg/kg raw ham and 41.20 ± 6.7 mg/kg, respectively. Whereas, the nitrate content in hams inoculated with strain LTH 3838 showed highest residual nitrate levels (135.31 ± 11.5 mg/kg raw ham). The end products (week 5) showed different lipid oxidation grades expressed as hexanal content (Fig. 1) with highest for raw hams inoculated with strain LTH 3838 (43.58 ± 24.2 ng hexanal/g raw ham) and lowest for nitrite control batch (9.05 ± 6.1 ng hexanal/g raw ham). During storage under light (like is typical for sliced raw hams in sales counter) the hexanal content increased for all batches in general and significantly for the inoculated raw ham LTH 3838 in comparison with the end product. Furthermore, the storage in the dark with vacuum reduced the additional formation of hexanal during storage for all batches. The addition of strain LTH 7036 showed similar results for hexanal content as nitrate control (no significant differences).

Conclusion

In cured raw hams,complex interactions of starter cultures with meat matrices, type of application as well as chemical and biological reactions involved in color formation and volatile aroma production takes part during processing and needs to be better understood. In general, nitrate reductase activity is an important factor on color formation in cured raw ham. In conclusion, the results show that a high intensity of nitrate activity (e.g. like for strain LTH 7036) is an important parameter not only for color formation but also for limited lipid oxidation during storage of sliced cured raw hams. For further work, a combination of nitrite and starter cultures with high nitrate reductase activity can be taken into account.

Notes

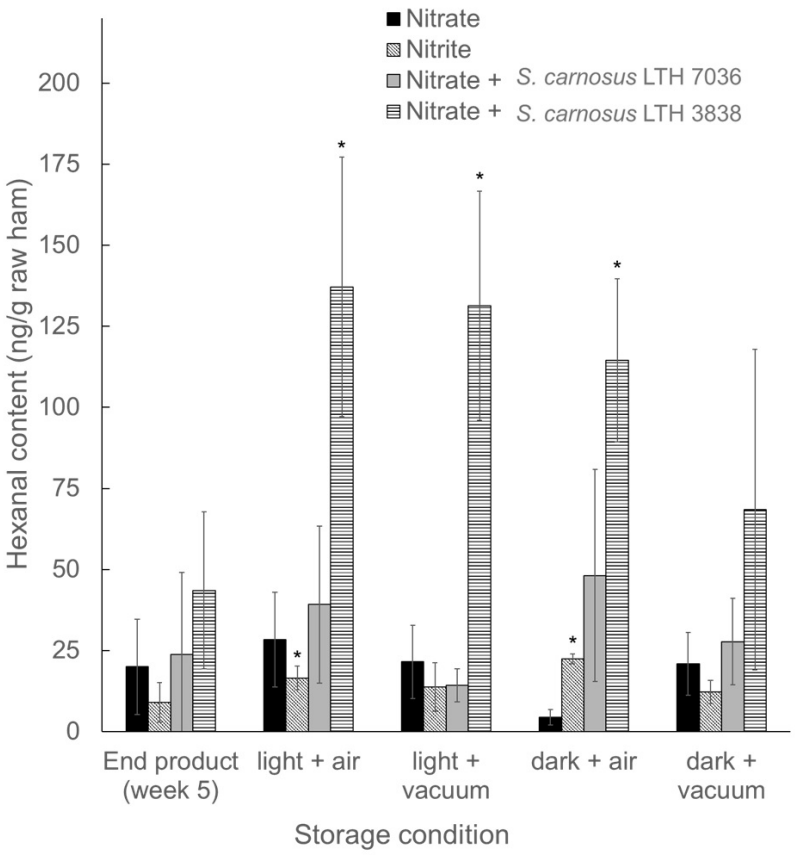

Figure 1: Mean hexanal content (ng hexanal/g raw ham) during different storage conditions.
Hexanal content as marker for lipid oxidation (*significant differences between end product and raw ham samples).

Notes