ASSESSMENT OF FIVE STRAINS OF *STAPHYLOCOCCUS EQUORUM* IN CURED RAW LOINS ON KEY AROMA COMPOUNDS

Monika Gibis[1*], Ramona Bosse (née Danz)[1], Mathias Wolz[1], and Jochen Weiss[1]

[1]Department of Food Physics and Meat Science, Institute of Food Science and Biotechnology, University of Hohenheim, Garbenstr. 25, 70599 Stuttgart; Germany.

*Corresponding author email: gibis@uni-hohenheim.de

Abstract – Marker volatiles of cured raw loins which were injected each with five *Staphylococcus equorum* strains were determined: two strains with high lipolytic and high nitrate reductase activity (LTH7065 & LTH7099), one with proteolytic and low nitrate reductase activity (LTH7052), one only with low nitrate reductase activity (LTH7098), and one with high lipolytic and low nitrate reductase activity (LTH7102). As hypothesis, these strains with diverse characteristics may form different levels of key aroma compounds during post-ripening (29-63 d). The volatiles were conducted by using Headspace-Trap-Gas-Chromatography. The positive effect of *S. equorum* cultures resulted in increased concentrations of 3-methylbutanal, acetophenone, and benzaldehyde compared to the control. Results gained after 63 days of ripening indicated that the levels of most aroma compounds increased.

Key Words – Cured raw ham, volatile marker compounds, Headspace-Trap-GC.

I. INTRODUCTION

The curing and drying process of cured raw hams and loins in Northern Europe is conventionally carried out by dry- or wet-curing or using a combination of both [1]. Commonly, the curing process is performed with sodium chloride and sodium nitrite and/or potassium nitrate. The application of starter cultures in raw hams or loins by injection is not usually applied. As bacterial group the coagulase-negative staphylococci is appropriate for the application of injection in a whole muscle system, because staphylococci do not acidify. It is known, that the formation of aroma volatiles was strain-specific [1]. We postulate as hypothesis that the five *S. equorum* strains [2] possess different physiological characteristics, which result in different levels of aroma marker compounds in cured loins using as model system for production of cured raw meat products.

II. MATERIALS AND METHODS

Starter cultures: Five different strains of *S. equorum* with different properties were selected (Table 1)
Cured raw loin production: Pork loins (*M. longissimus dorsi*); 6 batches were manufactured by injecting brine (10% (w/w) nitrite curing salt (0.9% $NaNO_2$)): one as control without starter culture, and 5 with different *S. equorum* strains (Table 1) (~ 107 cfu/mL brine) by using a multi-needle injector type 105 MC2 R (105 needles, 2 mm diameter, 0.7 bar injection pressure; Günther, Dieburg, Germany).
Volatile marker compounds: Gas Chromatography-FID system and a TurboMatrix 40 Trap Headspace sampler directly coupled to Clarus® GC 580 (Perkin Elmer, Germany) [3]
Statistical Analysis: Variance analysis (ANOVA) was performed with Sigmaplot® 12.5 (Systat Inc., USA).

III. RESULTS AND DISCUSSION

The concentrations of the key volatile compounds increased in the period between start and end of post-ripening time **(**Figure 1). Loins with *S. equorum* LTH7065 had the highest content of 3-methylbutanal after 63 days and with LTH7102 had the second highest level. Both strains were selected from Parma hams and had a very high lipolytic activity [2]. 3-methylbutanal is a typical degradation product from amino acids such as leucine or isoleucine, which can be released by intrinsic meat enzymes and bacterial peptidases. Interestingly, these strains had no proteolytic activity [2] (test protein casein) (Table 1). Additionally, levels of butanone increased during the post-ripening process in all batches including the control. Loins with *S. equorum* LTH7052 with a high proteolytic activity had the highest concentrations of acetophenone and benzaldehyde. Typical oxidative degradation products such as hexanal or 1-octenol had comparable levels before and after post-ripening, which may be a result of the nitrate reductase activity. The selected *S. equorum*

strains may be accelerate the formation of typical aroma profile and may be suitable starter cultures for raw cured loins or hams.

Table 1. Activity and source of the injected starter cultures (*S. equorum*) which were selected in a recent study [2]

Starter culture	Source	Lipolytic activity (mm)[a]	Proteolytic activity (mm)[a]	Nitrate reductase activity (mM/cfu)[a]
S. equorum LTH 7052	unknown	-	high	low
S. equorum LTH 7065	Parma	Very high	-	high
S. equorum LTH 7099	Black forest	high	-	Very high
S. equorum LTH 7102	Parma	Very high	-	low
S. equorum LTH 7098	Black forest	-	-	low

[a] Activity classes (very high >2, high >1, low <1, -: no activity)

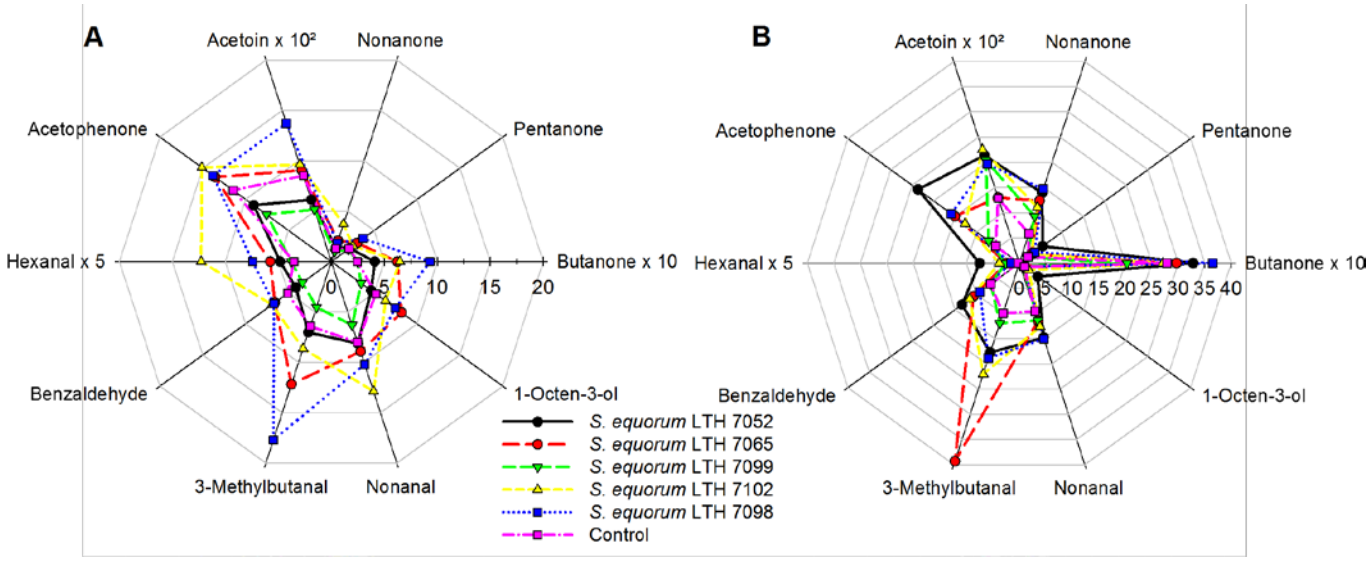

Figure 1. Figure 1. Overview of key volatiles (ng/g) by using 5 different strains of *S. equorum* in cured raw loins (A) after 29 and (B) 63 days

IV. CONCLUSION

The injection of *S. equorum* strains with different characteristics in loins mostly caused changes in the key aroma profiles after production (29 d) and after 63 days of post-ripening compared to the control without starters. The diverse properties of strains usually influenced the aroma profile of the raw cured loins.

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