EVALUATION OF SCALING EFFECTS ON MICROBIOLOGICAL AND PHYSICO-CHEMICAL CHARACTERISTICS OF RAW FERMENTED SAUSAGES

Schwendimann, L[1], Barett, J[2], Blase, R[1], Stoffers, H[1]

[1] Agroscope, Swiss Centre of Excellence for Agricultural Research, Switzerland

[2] School of Agricultural, Forest and Food Sciences, Berne University of Applied Sciences, Switzerland

Currently there are only very few studies about fermented sausages focusing on the industrial scale, they rather concentrate on smaller production sizes comparable to artisanal practice. As Agroscope is planning the construction of a pilot plant with biosafety level 3 allowing the production of food with intentional addition of pathogenic microorganisms, it is vital to investigate the microbial ecology in fermented products across ascending (industry) or descending (pilot and lab) production scales. Comparison of scales might help to ensure a reasonable extrapolation of future results to industrial processes.

Material and Methods

Raw fermented sausages were produced in two scales: pilot plant (40 kg) and lab (10 kg) with different production equipment using a starter culture containing *Lactobacillus sakei* and *Staphylococcus carnosus*.

All sausages were analyzed after 0, 1, 3, 7, 16 and 28 days on:

- pH value, weight loss, water activity, moisture
- *Listeria monocytogenes, Salmonella spp., Staphylococcus aureus*, Enterobacteriaceae and *E. coli* according to ISO-Standards
- Identification of bacteria grown on MRS agar or Mannitol Salt agar was done with MALDI-TOF MS

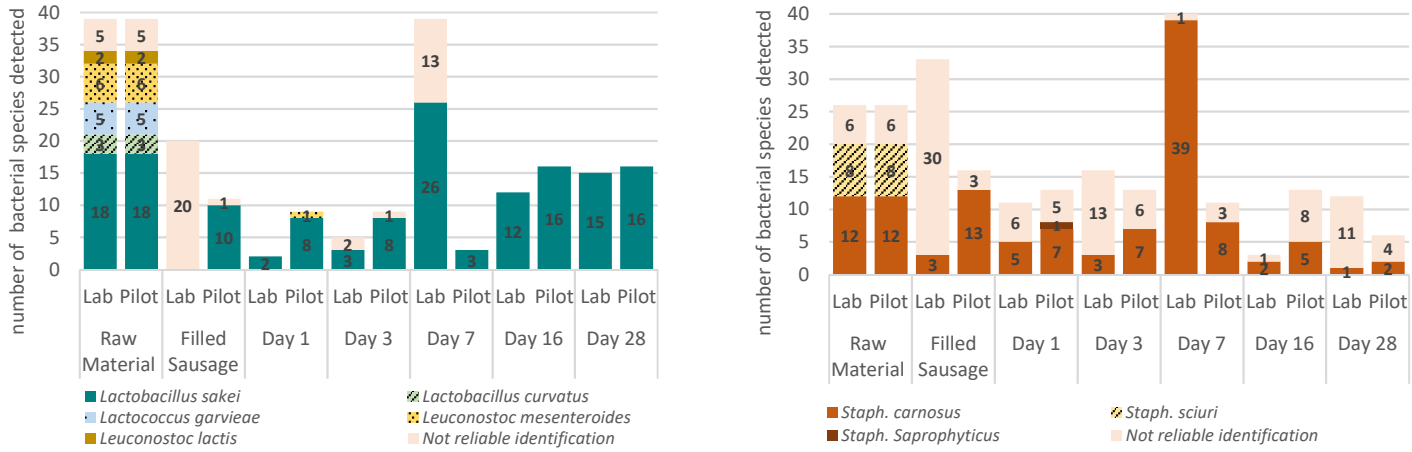

Figure 1: *Identified Lactobacilli (left) species and Staphylococcus species (right) in pilot and lab scale produced sausages by MALDI-TOF MS from isolates grown on MRS agar/Mannitol Salt agar at different time points of production*

Results and Discussion

- pH values were not affected by the different scales (data not shown) → acidification process was comparable
- After 16 and 28 days there were no significant differences (p>0.05) in weight loss between the scales (data not shown).
- The concentrations of lactic acid bacteria was comparable to the ones described by Comi et al. [1] and Garriga et al. [2]
- In both scales starter culture changed the natural microbiological community and became dominant (Figure 1)
- No significant differences ($p > 0.05$) in the a_w-value between the different scales (data not shown)
- *Listeria monocytogenes* was detected until the 7th day of fermentation, *Salmonella* spp. until the end of ripening (data not shown)

- ❖ Differences in production equipment of the two scales did not have an impact on the quality parameter as well as on the behaviour of the starter bacteria
- ❖ Results showed that MALDI-TOF MS might be used to monitor the behaviour of starter cultures in raw fermented sausages during fermentation and ripening

References:

[1] Comi, G., Urso, R., Iacumin, L., Kalliopi, R., Cattaneo, P., Cantoni, C. & Cocolin, L. (2005). Characterisation of naturally fermented sausages produced in the North East of Italy. Meat Science 69: 381-392.

[2] Garriga M., & Aymerich T. (2015). The Microbiology of Fermentation and Ripening. In F. Toldrá, Y.H. Hui, I. Astiasarán, J. Sebranek & R. Talon, Handbook of Fermented Meat and Poultry (pp. 107-115). West Sussex: John Wiley & Sons, Ltd.

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
Agroscope