

IMPACT OF DIFFERENT SMOKE CONDENSATES ON THE PHYSICO-CHEMICAL, CHEMICAL AND SENSORY PROPERTIES OF DRY FERMENTED SAUSAGES

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Dry fermented sausages were smoked using 4 different kinds of smoke condensates. Physicochemical (water activity, dry matter, texture, colour), chemical (aroma profiling) and sensory properties of these sausages were assessed. The aroma profiles of the dry fermented sausages were all very different, as the chemical composition of the smokes was different. Of the other investigated parameters, only the colour and sensory properties of the sausages were significantly different. Higher amounts of phenolic and carbonylic components resulted in darker sausages. Clear differences in sensory properties were seen in smoke aroma and smoke flavour.

Key Words – carbonylic compounds, liquid smoke, phenolic components

I. INTRODUCTION

In earlier days, meat was smoked to prolong the shelf life. Nowadays meat is smoked to give it a specific organoleptic profile [1]. Many different smoke condensates exist, each with its own chemical composition. The chemical composition depends primarily on the kind of wood (content of cellulose, hemi-cellulose and lignin), moisture content of the wood and pyrolytic conditions [2]. Phenolic compounds are formed by pyrolysis of lignin. They are known to contribute to smoke flavour and colour of liquid smokes and have both antimicrobial and antioxidative properties [2]. Carbonyl-containing components, originating from cellulose, give sweet or burnt-sweet aromas and soften the heavy smoke aroma linked with phenolic content. The carbonylic components are also involved in the textural changes in smoked food due to interactions with proteins and contribute to the golden-brown colour of smoked products because of the reaction with amino acids and formation of maillard products [2]. Furans contribute to the overall smoky odour of liquid smokes and primarily soften the heavy smoky aroma of phenolic components. Furans are formed during maillard reactions. Organic acids have an impact on the flavour (sourness), colour, texture and microbial stability of food [2]. The goal of this study was to investigate the influence of different smoke condensates on the physico-chemical, chemical and sensory properties of dry fermented sausages.

II. MATERIALS AND METHODS

Dry fermented sausages were prepared by cutting frozen meat (38.89%) until particles of ca 5mm were achieved. Hereafter, the starter culture (0.1g/kg) and the frozen fat (27.78%) were added into the bowl cutter. Subsequently white pepper (2g/kg), nutmeg (0.4g/kg), dextrose (7g/kg) and sodium ascorbate (0.5g/kg) were added. Finally the fresh meat (33.33%), sodium chloride (28g/kg) and sodium nitrite (150 ppm) were added to the meat batter. The meat batter was stuffed into naturin casings. The sausages were fermented during three days at 24°C and a relative humidity of 90-95%. During the fermentation, the sausages were smoked through atomization (Kerres Analagensysteme GmbH, Backnang, Germany) of smoke condensate. Four batches of dry fermented sausages were made, each smoked with a different smoke condensate. After the fermentation, the sausages were dried/ripened (14°C / 87% RH) until a weight losses of 20% was achieved. Finally, the dry fermented sausages were MAP packed (30% CO₂/70% N₂) and stored until analysis. The end products were analysed for water activity (Aqualab, Decagon Devices, USA), texture (Model LF plus, Lloyd Instruments Ltd, England) and colour measurement (L*, a*- and b*-value, MiniScan EZ, Elscolab, Belgium). Aroma profiling was performed using an 7890A GC system combined with an 5975C inlet XL MSD with triple axis detector (Agilent technologies, RIC, Belgium). A capillary column of type ZB-5MS was used (length 30 m, I.D. 0,25 mm and film thickness 0,25 µm) (Zebron, Phenomenex, USA). Statistical evaluation was performed using One Way ANOVA (PASW statistics 21, SPSS). As a post hoc test, Tukey was selected to compare the results at a significance level of p<0.05.

Sensory analysis was performed by an experienced panel (n=12) using Quantitative Descriptive Analysis (QDA). Each of the dry fermented sausages was tasted in comparison with a commercial reference. The difference in score

of each sausage with respect to the score of the commercial sausage was calculated, median values of these differences are reported.

III. RESULTS AND DISCUSSION

The aroma profiles of the dry fermented sausages are shown in Figure 1A. In general, the aroma profiles reflect the profile of the individual smoke condensates itself (results not shown). These differences in composition affect the sensory and physico-chemical properties of the dry fermented sausages.

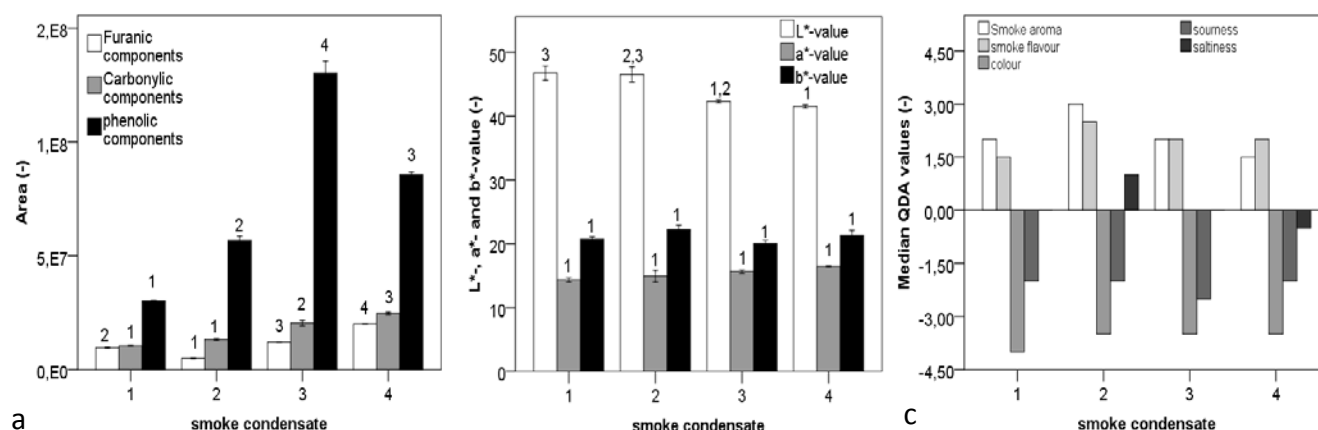


Figure 1: presentation of a) chemical aroma profile of dry fermented sausages, b) colour measurements and c) results of QDA test. The indicated numbers represent statistical analysis of each attribute between the 4 smoke condensates. Mean values indicated by the same number are not significantly different ($p < 0.05$).

The smoke condensates have a significant influence on the lightness (Figure 1b, L*-value), but not on the a*- or b*-value. Generally, higher amounts of phenolic and carbonylic components (smoke condensates 3 and 4) result in lower L*-values. During sensory tests, sample 1 is said to be less dark than the other samples (Figure 1c). No significant difference is seen in the texture or water activity of the samples (results not shown). Changes were mostly observed in sensory tests (Figure 1c). The sausages smoked with smoke 2 received the highest score for smoke flavour and smoke aroma intensity. This is not as expected based on the aroma profiles, as this sausage does not have the highest concentration in (total) phenolic nor furanic components. Probably, specific phenolic and/or furanic compounds strongly affect the sensory characteristics, rather than the sum of these compounds. Sausages that received a higher score with respect to smoke flavour, were evaluated as tasting saltier.

IV. CONCLUSION

As different smoke condensates were used, each dry fermented sausage received its own specific aroma profile. This resulted in differences in colour, but more importantly in sensory characteristics.

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