INFLUENCE OF SPICE EXTRACTS ON THE QUALITY CHARACTERISTIC OF HARBIN DRY SAUSAGE

Qinxiu Sun, XinXin Zhao, Chao Zhang and Baohua Kong*

College of Food Science, Northeast Agricultural University, Harbin, Heilongjiang 150030, China

*Corresponding author email: kongbh63@hotmail.com

I. INTRODUCTION

Harbin dry sausage is usually produced by natural fermentation, making it difficult to guarantee the quality of the dry sausage. As a substitute for chemical and synthetic preservatives, cinnamon, clove, and anise are commonly used in the preservation of meat products for their flavour and antimicrobial and antioxidant activities. Therefore, the purpose of this study was to investigate the influence of spice (cinnamon, clove, and anise) extracts on the physicochemical properties, microorganisms, and sensory quality of dry sausage.

II. MATERIALS AND METHODS

Dry sausages were prepared according to a procedure described by Sun et al. [1]. Four groups of dry sausages were prepared. The control group did not contain spice extracts, and the other three groups received alcohol extracts of cinnamon, clove, and anise, respectively. There were 82 sausages in all. For each treatment, there were 21 sausages. The pH and moisture content were measured according to Sun et al. [1]. Thiobarbituric acid reactive substances (TBARS) value were measured as described by Wang and Xiong [3]. Plate counts were used to determine the count of total aerobic bacteria, lactic acid bacteria (LAB), and enterobacteriaceae according to Sun et al. [1].The sensory quality of the dry sausage was evaluated as described by Sun et al. [1]. Data were expressed as the mean values accompanied by the standard deviation of means and analysed by Statistix 8.1. The confidence interval was set at 95% ($P < 0.05$).

III. RESULTS AND DISCUSSION

As indicated in Fig.1 A, the addition of spice extracts decreased the pH of sausage during the fermentation, with cinnamon being the lowest among all samples ($P < 0.05$). At the end of fermentation, the moisture content in sausages with cinnamon and anise were lower than the control ($P < 0.05$; Fig.1 B), which may be associated with changes in pH. The decrease in pH may cause some muscle protein denaturation and reduce the water holding capacity of protein. The TBARS values (Fig.1 C) of sausages observably decreased by spice extracts, and the sausages with anise extract had the lowest TBARS value, which was 21.12% lower than control ($P < 0.05$). This result suggested that spice extracts have antioxidant activity and can be used as an effective antioxidant in dry sausage. As depicted in Fig.1 D, at the end of fermentation, lower total aerobic bacterial counts ($P < 0.05$) were observed in samples with spice extracts, which may be related to the antibacterial effect of the spice extract. For LAB (Fig.1 E), no significant differences were obtained among the four groups ($P > 0.05$) at the end of fermentation, which indicated that spice extracts did not inhibit the growth of LAB. The enterobacteriaceae counts (Fig.1 F) were reduced in sausages with spice extracts, indicating that cinnamon, anise and clove had an inhibitory effect on enterobacteriaceae.

As shown in Table 1, there were no significant differences ($P > 0.05$) in the colour scores among the sausages. The sausages with spice extracts had significantly higher scores for taste, odour, sourness, chewiness and overall acceptability than those of the control samples ($P < 0.05$), while there was no significant difference among the sausages with three different spice extracts ($P > 0.05$). These results suggest that the addition of spice extracts can improve the sensory quality of dry sausage.

IV. CONCLUSION

The pH value, moisture content, water activity, and TVB-N in dry sausage were decreased by spice extracts, with cinnamon being the lowest. The oxidation of dry sausage was reduced by spice extracts (especially anise) compared to the control. Additionally, the spice extracts inhibited the growth of enterobacteriaceae and improved the sensory quality of dry sausage.

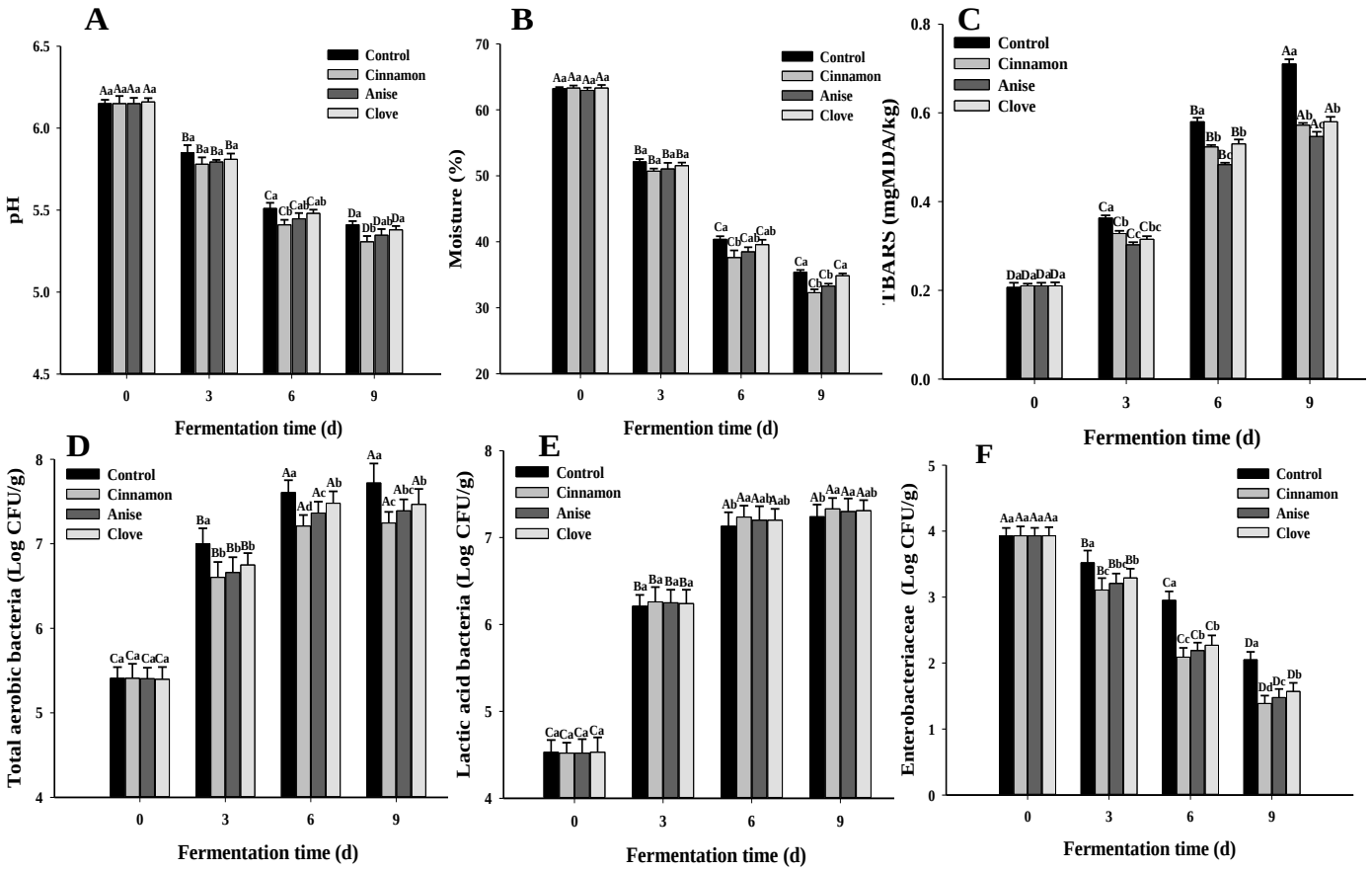

Fig.1 Influence of spice extracts on the physicochemical quality and microorganism (A) pH; (B) moisture; (C) thiobarbituric acid reactive substances (TBARS); (D) total aerobic bacteria; (E) lactic acid bacteria; and (F) enterobacteriaceaeof dry sausage during fermentation. Means in the same sausage group with different uppercase letters (A to D) differ significantly ($P < 0.05$); means between sausage groups on the same days with different lowercase letters (a to d) differ significantly ($P < 0.05$).

Table 1. Sensory evaluation of dry sausages with various spice extracts after fermentation

	Colour	Taste	Odour	Sourness	Chewiness	Overall acceptability
Control	4.95 ± 0.02^{a}	4.27 ± 0.07^{b}	4.37 ± 0.14^{b}	4.38 ± 0.04^{b}	4.73 ± 0.09^{b}	4.51 ± 0.07^{b}
Cinnamon	5.02 ± 0.08^{a}	5.39 ± 0.23^{a}	5.47 ± 0.12^{a}	5.47 ± 0.12^{a}	5.37 ± 0.08^{a}	5.47 ± 0.02^{a}
Anise	5.01 ± 0.07^{a}	5.24 ± 0.06^{a}	5.43 ± 0.09^{a}	5.43 ± 0.09^{a}	5.41 ± 0.05^{a}	5.41 ± 0.04^{a}
Clove	5.05 ± 0.12^{a}	5.23 ± 0.08^{a}	5.41 ± 0.11^{a}	5.41 ± 0.11^{a}	5.39 ± 0.13^{a}	5.40 ± 0.12^{a}

$^{a-b}$ Differences in same column indicate significant differences ($P < 0.05$).

ACKNOWLEDGEMENTS

Kong B. H. thanks the financial support from the National Natural Science Foundation of China (31771990) and the National Key Research and Development Plan during the 13th five-year plan period (2016YFD0401504-03).

REFERENCES

1. Sun, Q., Chen, Q., Li, F., Zheng, D., & Kong, B. (2016). Biogenic amine inhibition and quality protection of Harbin dry sausages by inoculation with *Staphylococcus xylosus* and *Lactobacillus plantarum*. *Food Control, 68*, 358-366.
2. Zhang, L., Li, X., Lu, W., Shen, H., & Luo, Y. (2011). Quality predictive models of grass carp (*Ctenopharyngodon idellus*) at different temperatures during storage. *Food Control, 22*(8), 1197-1202.
3. Wang, L. L., & Xiong, Y. L. (2005). Inhibition of lipid oxidation in cooked beef patties by hydrolyzed potato protein is related to its reducing and radical scavenging ability. *Journal of Agricultural & Food Chemistry, 53*(23), 9186-9192.