EFFECT OF FEED TYPE ON PORK AND DRY SAUSAGE QUALITY

HONKAVAARA M.

Finnish Meat Research Centre, Hämeenlinna, Finland

S-IVA.49

SUMMARY

The results indicated that feed type had a minor effect on the gross chemical and intramuscular fatty acid composition of lean meat in the middle of *m.longissimus dorsi* (LD). On the other hand, feed type had a significant influence on the colour (L, a, b values) and fatty acid composition of backfat.

Pig feed types had a major effect on the ripening and composition of fermented dry sausage. This was a consequence of the composition of the backfat used for the sausage manufacture. There were differences in percent weight losses, free fatty acid (FFA) production and fat exudation from the core to the surface of sausage. However, in sensoric evaluation all sausage types earned acceptable total scores.

Introduction

It is well known that the composition of feed has a significant influence on the quality of pork fat. Because the chemical composition of subcutaneous and intramuscular fat have a prominent effect on the physical and chemical properties of meat it could be concluded that fat also has a great technological value.

Gustincic et al. 1975 concluded that feeding of medium chain fatty acids increased the content of lauric, myristic and palmitoleic acid in pork fat. They found that meat from these pigs did not have typical porky flavour. Moreover, the authors concluded that pork with a high level of medium chain fatty acids was unsuitable for the production of cooked ham and dry sausage.

Houben and Krol 1980 found that the use of pork raw materials with an increased level of polyunsaturated fatty acid (PUFA) for the preparation of heated products - pork loin roll, smoked sausage, liver sausage and luncheon meat - did not present any major problems. Only the preparation of fermented Dutch style cervelat sausages created problems.

The purpose of this work was to evaluate those differences in the quality of pork and in the preparation of fermented dry sausage that could result from different actual feed types.

Material and methods

Feed Types

Four farms were chosen according to their feed type both in southern and central Finland. The farms were "all in - all out" units with 200-300 Finnish Landrace and Yorkshire crosses. Pigs were fed a restricted ration twice a day with concentrate plus home grown cereals (typed as "normal"), normal plus vegetable fat ("energy"), normal plus dried distiller's grain ("barley") and finally normal plus dried distiller's grain and animal fat ("barley plus animal fat"). Feeding started at an average weight of 30 kg. Feed intake and growth proceeded normally.

Pigs were slaughtered at two commercial abattoirs in southern and central Finland. Mean weight at slaughter was 110 kg. After a 24 hour chill at 4°C, the lean meat and backfat of pig carcasses were trimmed for commercial dry sausage manufacture.

Pork samples

About 300 g samples were taken from subcutaneous backfat at the level of the 8th rib and from the middle part of the *M.longissimus dorsi* (LD). The samples were analysed after freezer storage at -20°C for two weeks. During storage, they were kept in polyethylene bags.

Preparation of fermented dry sausage

Four carcasses were required for one 150 kg mixture of each feed type. Sausages were prepared in two commercial factories (1 and 2). Loins, hams and backfat were trimmed for sausage manufacture. In factory 1, the formula included 47.6 % pork, 20.3 % beef, 28.1 % backfat, 3.7 % salt and spices, 0.02 % starter culture and 0.04 % ascorbic acid, 0.09 % sodium nitrite (10 % solution) and 0.13 % potassium nitrite (10 % solution). In factory 2, the formula included 33.2 % pork, 33.2 % beef, 29.9 % backfat, 3.6 % salt and spices, 0.07 % starter culture and 0.03 % sodium nitrite.

Frozen trimmings were separately ground through a 3 to 5 mm plate, then meat, salt and starters were thoroughly mixed in a cutter and, finally, backfat was chopped into the mixture. The mix, with internal temperature of -3 °C was stuffed into 65 mm cellulose casings of approximately 1 kg capacity. The sausages were initially kept at 22 °C for 3 days, and were then fermented at 19-21 °C for 8 days while being smoked daily for 5-7 hours. Finally, the sausages were dried at 16 °C for 21 days.

Samples were taken after chopping, after 3 days and fermentation, and after drying.

Analytical methods

Moisture and fat were determined by the Nilsson and Kolar method (1971). Protein (Kjeldahl N•6,25) was analyzed by the ISO/R 937 method. Salt was measured by conductometric titration (Corning 926 Chloride Analyzer). Fatty acids were analyzed as fatty acid methyl esters (Honkavaara 1989). Colour was measured with the Minolta Chroma Meter CR 200 (L, a, b values). The consistency of the fermented dry sausages was measured with the Instron testing machine. The compression force (kp) was measured as the maximum height of the force/deformation curve.

Results and discussion

Lean meat

Table 1 presents the gross chemical composition of lean meat. The LD muscle of "energy" pigs contained more moisture than that of "barley plus animal fat" pigs ($P<0.05$). In contrast, fat content was lower in the former than in the latter ($P<0.05$). No significant differences were noted in protein content.

Feed type had a minor effect on the intramuscular fatty acid composition (table 2). "Barley plus animal fat" pigs had a higher ($P<0.05$) amount of intramuscular stearic acid (18:0) than "normal" or "energy" pigs. "Normal" pigs had a higher ($P<0.05$) percentage of palmitoleic acid (16:1) than "energy" pigs.

Backfat

Table 3 shows that the backfat of "normal" and "energy" pigs had significantly higher ($P<0.05$) L values than that of "barley" or "barley plus animal fat" pigs. Backfat of "barley" pigs had the lowest a and b values ($P<0.05$).

Table 4 shows that the backfat of "barley" pigs was the most saturated and firmest as indicated by the highest C18:0/C18:2 ratio of 1.37. On the other hand, the backfat of "energy" pigs was the least saturated and softest as indicated by the lowest C18:0/C18:2 ratio of 0.64. As a matter of fact, the latter had the highest amount of mono- and polyunsaturated fatty acids.

Fermented dry sausage

In both factories 1 and 2, the percent weight loss was highest in the "normal" batch, 42% and 49%, respectively. Weight loss was the lowest, 39%, in the "barley" batch (factory 1) and 43% in the "barley plus animal fat" batch (factory 2). At the same time, fat content increased the most, 50-56%, in the "normal" batch (factory 1 and 2). Furthermore, protein content increased the most, 42%, in the "energy" batch (factory 1) and 57% in the "barley plus animal fat" batch (factory 2).

During ripening, the FFA content increased from 0.3 to 4.8%. FFA production was most prominent in the "barley" batch (factory 1) and in the "barley" and "energy" batches (factory 2). After drying, "normal" sausage had the lowest and "energy" sausage the highest FFA content (table 5).

The initial pH of the "barley" batch was 0.1 pH units higher than in the other batches. During fermentation, the pH of the "barley" batch decreased the fastest so that after 4 days ripening its pH was 0.1 pH units lower than in other batches. This difference was found also in finished sausages.

Table 5 shows that "normal" sausage had the lowest moisture, but a high fat and protein content. In addition, normal sausage had the highest consistency value of 8.2 kp.

In factory 2, "barley" sausage had the lowest moisture and highest consistency value of 18.8 kp whereas "energy" sausage had the lowest Instron value of 8.1 kp (table 6).

In sensoric evaluation all sausage types earned acceptable total scores. "Normal" sausages had better appearance, texture and flavour than other types. In factory 1, the "barley" sausage had the lowest total score. Moreover, in factory 1, the surface of the "energy" sausage was fatty due to the soft fat exuded from the core of the sausage. Similarly, Houben and Krol (1980) found that fermentation type sausages of acceptable quality could not be prepared with increased levels of PUFA.

"Normal" sausages had a high amount of palmitic (16:0), palmitoleic (16:1) and oleic acid (18:1) whereas "energy" sausage had high percentages of oleic, linoleic (18:2) and linolenic acid (18:3). Furthermore, "barley" sausage had a high level of palmitic, stearic (18:0) and linoleic acid. "Barley plus animal fat" sausages had the highest amount of stearic acid (tables 7 and 8).

Conclusion

In this study, feed type had a minor effect on intramuscular fatty acid contents, but a significant influence on subcutaneous fat. Moreover, the results showed that intramuscular and subcutaneous fatty acid contents of pork had a prominent influence on the fatty acid contents of fermented dry sausages.

References

Gustincic, V., Kramer, A. and Prabucki, A.L. (1975). Technological behaviour of pork with an increased content of medium chain fatty acids. Proc. 21st Eur. Meet. Meat Res. Workers, Bern, pp 148-150.
Houben, J.H. and Krol, B. (1980-81). Acceptability and storage stability of pork products with increased levels of polyunsaturated fatty acids. Meat Sci., 5(1):57-70. Honkavaara, M (1989). Influence of porcine stress and breed on the fatty acid profiles of subcutaneous and intramuscular total lipids. Fleischwirtsch., 69(9):1429-1432.