SEASONAL VARIATION IN THE BACKFAT QUALITY OF BACONER PIGS IN SOUTH AFRICA

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Introduction

Wood (1984) defined good quality fat in pigs as firm and white. He defined poor quality fat as soft, oily, wet, grey and floppy. Processed meat products like bacon and fermented sausages are especially affected by soft, unsaturated fat of poor quality (Fischer, 1989). Feed ingredients commonly used in pig diets in South Africa are rich in unsaturated fatty acids and have the potential to produce soft backfat with poor technological properties (van der Merwe, 1985). Other factors that may contribute to inferior fat quality are the very low slaughter weights and constant decrease in backfat thickness of South African pigs over the last decade (SAMIC, 2005). It was previously found that the degree of saturation of the body fat is influenced by environmental temperature, with more unsaturated fat (poor fat quality) in a cold environment and more saturated fat (good fat quality) in pigs kept in warm surroundings (Close, 1983). The objective of this study was to ascertain whether season of the year affected the fat quality of baconer pigs in the mild South African climate.

Materials and Methods

A total of 1620 pig carcasses were sampled over a one year period at a major South African pig abattoir, with monthly intervals. The researchers collected 45 backfat samples from each of the P, O and R classification groups with each monthly sampling. The average weight of the carcasses was 72.81 ± 6.01 kg meaning that carcasses can be considered as baconer carcasses suitable for the processing market. A backfat sample was removed at the midline position of each carcass. Total lipid was extracted from the backfat, according to the method of Folch et al. (1957).

Fatty acid methyl esters (FAME) was prepared using methanol-BF3 (Slover and Lanza, 1979) and were quantified using a Varian GX 3400 flame ionization gas chromatograph, with a capillary column (Chrompack CPSIL 88, 100 m length, 0.25 μm ID, 0.2 μm film thickness). Identification of FAME was made by comparing retention times with those of standards obtained from SIGMA (189-19). The following fatty acid ratios were calculated: stearic to linoleic acid ratio (C18:0/C18:2) and double bond index (DBI). Iodine value was determined by means of the Hanus method (AOAC, 2000). Refraction index was determined with an Abbe refractometer (AOAC, 2000). Analysis of variance (ANOVA) and the Tukey-Kramer multiple comparison test was used to determine whether fat quality parameters of pig carcasses differ significantly between months.

Results and discussion

No significant differences were observed in backfat thickness of carcasses between months (Table 1) The means that differences in fat quality can not be ascribed to variation in fat thickness. Iodine values and refraction index showed a significant ($P<0.001$) seasonal trend. Iodine values and refraction index values were significantly higher in the winter months (June, July and August) compared to the summer months (December, January and February). This implicate that carcasses had better fat quality in the summer months compared to the winter months. Although carcasses from no month group could reach an iodine value lower than 70 proposed by Barton-Gade (1987) as the maximum for good fat quality, the February carcasses came close to this value with an iodine value of 70.55. No classification group could reach a refraction index value of below 1.4598 proposed by Hart (1956) as the maximum for good fat quality.

Physical fat quality results were confirmed by fatty acid analysis. Saturated fatty acid content (C16:0 and C18:0) and mono-unsaturated fatty acid content (C18:1) were significantly ($P<0.001$) lower and polyunsaturated fatty acid content (C18:2) were signifcantly higher in winter months compared to summer months. No month groups could reach the C18:0 content of more than12 % proposed by Houben and Krol (1983) or a C18:2 content of less tha 15 % proposed by Enser (1983) for good fat quality. Double bond index (DBI) was significantly ($P<0.001$) higher and C18:0/C18:2 ratio significantly ($P<0.001$) lower higher in the winter months compared to the summer months but no summer month group could comply with the maximum DBI value of 80 proposed by Prabucki (1991) or the C18:0/C18:2 ratio of more than 1.2 proposed by Honkavaara (1989) for good fat quality.

Conclusions

A statistical significant seasonal trend in backfat quality was observed. The results demonstrated that backfat from pigs were firmer and more saturated during mid-summer, leading to better technological quality, while the opposite was true for mid-winter. The seasonal variation in fat quality may be ascribed to the effect of difference in ambient temperature on fat metabolism, the seasonal availability of feedstuffs or a combination of these two factors. The seasonal difference in the fat quality was so large that a significant improvement in the winter fat quality would cause an improvement in the overall fat quality. This could possibly be achieved by including feed ingredients rich in saturated fatty acids in pig rations during winter months.

Table 1: Seasonal trend in fat quality parameters of baconer pigs in South Africa. (n=1620)

	Month of slaughter											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Physical and chemical fat quality parameters:												
BFT (45mm)	**15.30** (3.35)	**14.96** (3.15)	**15.34** (3.31)	**15.19** (3.05)	**15.19** (3.08)	**15.08** (3.12)	**15.04** (3.31)	**14.72** (3.26)	**15.24** (3.15)	**15.42** (2.92)	**15.22** (3.14)	**15.26** (3.24)
RI	**1.4608**^{a} (0.0005)	**1.4609**^{ab} (0.0006)	**1.4611**^{bc} (0.0007)	**1.4611**^{bcd} (0.0005)	**1.4610**^{ac} (0.0005)	**1.4612**^{ce} (0.0007)	**1.4614**^{e} (0.0007)	**1.4613**^{de} (0.0007)	**1.4612**^{ce} (0.0007)	**1.4611**^{bc} (0.0006)	**1.4610**^{ac} (0.0006)	**1.4609**^{ab} (0.0006)
IV	**71.01**^{a} (4.11)	**70.55**^{a} (4.56)	**72.19**^{ab} (4.86)	**72.16**^{ab} (4.33)	**72.03**^{ab} (4.27)	**75.71**^{d} (5.64)	**77.95**^{e} (6.04)	**75.34**^{d} (5.75)	**74.39**^{cd} (5.47)	**73.35**^{bc} (4.85)	**73.36**^{bc} (4.75)	**72.18**^{ab} (4.59)
Individual fatty acids:												
C16:0	**22.30**^{d} (1.19)	**22.39**^{d} (1.38)	**21.66**^{bc} (1.39)	**22.09**^{cd} (1.25)	**21.87**^{cd} (1.21)	**21.14**^{ab} (1.51)	**20.81**^{a} (1.48)	**20.96**^{a} (1.64)	**21.64**^{bc} (1.56)	**21.66**^{bc} (1.52)	**21.54**^{bc} (1.33)	**21.92**^{cd} (1.32)
C18:0	**11.75**^{cde} (1.32)	**12.05**^{df} (1.26)	**11.85**^{cde} (1.32)	**12.23**^{ef} (1.38)	**11.90**^{cde} (1.17)	**11.49**^{bc} (1.22)	**10.83**^{a} (1.28)	**11.21**^{ab} (1.46)	**11.52**^{bd} (1.34)	**11.66**^{bd} (1.38)	**11.93**^{cde} (1.53)	**11.84**^{cde} (1.43)
C18:1	**40.99**^{ghi} (1.74)	**40.35**^{ceg} (2.07)	**40.53**^{ei} (1.81)	**39.39**^{ab} (2.30)	**40.40**^{eh} (1.97)	**39.14**^{a} (2.44)	**40.10**^{bcef} (2.27)	**39.59**^{ac} (2.75)	**39.91**^{ade} (2.26)	**40.69**^{ei} (1.68)	**40.80**^{fghi} (2.34)	**40.89**^{ghi} (2.06)
C18:2	**16.41**^{a} (2.66)	**16.18**^{a} (3.05)	**17.11**^{ab} (2.87)	**16.99**^{ab} (2.67)	**17.29**^{ab} (2.75)	**19.70**^{d} (4.34)	**19.85**^{d} (3.51)	**18.66**^{cd} (4.42)	**17.90**^{bc} (4.14)	**17.40**^{ac} (3.51)	**16.96**^{ab} (3.29)	**16.68**^{a} (3.00)
Fatty acid ratios:												
C18:0/ C18:2	**0.74**^{df} (0.19)	**0.78**^{ef} (0.20)	**0.72**^{cde} (0.18)	**0.74**^{df} (0.18)	**0.71**^{cde} (0.15)	**0.62**^{ab} (0.20)	**0.57**^{a} (0.15)	**0.65**^{bc} (0.23)	**0.69**^{bd} (0.21)	**0.71**^{cde} (0.21)	**0.74**^{df} (0.22)	**0.74**^{df} (0.20)
DBI	**83.23**^{a} (4.78)	**83.08**^{a} (5.67)	**84.91**^{ac} (6.00)	**84.21**^{ab} (5.35)	**84.75**^{ab} (4.95)	**89.12**^{d} (7.08)	**89.58**^{d} (6.44)	**89.44**^{d} (7.01)	**87.26**^{cd} (6.73)	**86.42**^{bc} (6.09)	**86.03**^{bc} (6.00)	**84.62**^{ab} (5.59)

The value in brackets refer to standard deviation. Means with different superscripts within the same row differ significantly ($P < 0.001$). BFT = Backfat thickness

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