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Short communications

A note on the effect of wheat versus maize on the backfat composition of baconer pigs

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The effect of grain source (wheat or maize), sex (boars or gilts) and live mass (85 or 120 kg) on the fatty acid composition of backfat was studied on 40 *ad lib.* fed Landrace × Large White pigs. A highly significant ($P<0,001$) difference in linoleic acid concentration between dietary treatments was found. Sex had only an influence on the myristic acid content while live mass had a significant effect upon backfat composition.

Die invloed van graankomponent (koring of mielies), geslag (bere of soê) en lewende massa (85 of 120 kg) op die vetsuursamestelling van rugspek is op 40 *ad lib.*-gevoerde Landras × Grootwit varke bestudeer. 'n Hoogs betekenisvolle ($P<0,001$) dieeteffek op linoleïensuurkonsentrasie is gevind. Geslag het slegs 'n effek op miristiensuurinhoud gehad terwyl lewende massa bykans al die vetsure betekenisvol beïnvloed het.

Keywords: Wheat, pig diets, backfat composition

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During the catastrophic drought of 1984, the local maize crop had to be supplemented by grain imports which also included feed grade wheat. During normal rainfall years, however, the South African Wheat Board also has wheat of a feed grade available on a more permanent basis which in the past has had to be exported at a loss. It is necessary, therefore, that this grain source should be evaluated locally for feeding purposes.

The meat processing industry uses a heavy baconer with a live mass of about 130 kg to produce products such as Salami. Recently, complaints about the fat quality of heavy baconers in terms of firmness have been received but not about that of ordinary baconers (90 kg live mass). Ericson, Miller, Hill, Black, Bebiak & Ku (1980) found that the replacement of maize by wheat led to significantly higher percentages of the saturated fatty acids, which result in a firm fat with less of a tendency to become rancid. The ether extract contents of maize and wheat are, according to NRC (1974) 4,5% and 1,9% respectively on a dry matter basis while the linoleic acid (C18:2) contents are 2,05% and 0,65% respectively.

The purpose of the present study was to determine whether the fatty acid composition of heavy baconers differs from that of ordinary baconers and to what extent it can be altered by feeding wheat as the grain source. Furthermore, the effect of sex on fat composition was also investigated.

The experimental diets (Table 1) were compiled to be isolysinic and isocaloric. However, the digestible energy content of the wheat used was lower (14,95 MJ DE/kg DM; Kemm, Siebrits & Ras, 1986) than anticipated (16,09 MJ DE/kg DM; Wiseman & Cole, 1979) so that the diets did not have the same energy content.

Table 1 Percentage composition of maize and wheat-based experimental diets (on an air-dry basis)

Component	Diet	
	Maize	Wheat
Yellow maize meal	63,4	—
Wheat	—	67,4
Fish meal	6,5	3,0
Wheaten bran	17,4	17,4
Sunflower oilcake meal	9,5	9,0
Synthetic lysine	0,077	0,169
Salt	1,0	1,0
Monocalcium phosphate	0,067	0,1
Feed lime	1,86	1,73
Vitamin and Mineral mixture[a]	0,2	0,2
Calculated composition		
Protein (%)	17,1	20,1
Lysine (%)	0,8	0,8
DE (MJ/kg)	13,0	12,6

[a] Commercial vitamin-mineral premix

Forty Landrace × Large White pigs (20 boars and 20 gilts) were allotted to four groups, namely boars (MB) and gilts (MG) on the maize diet and boars (WB) and gilts (WG) on the wheat-based diet. The pigs were housed individually and received their diets *ad lib.*. Within each group five pigs were randomly selected for slaughter at about 85 kg while the other five were slaughtered at about 120 kg. Backfat samples over the shoulder and loin were taken, vacuum packed in airtight plastic bags and kept at –20°C until analysed. The samples were analysed for refractive index (R I) according to the method of Lees (1971), saponification value (S F) as described by Paquot, (1979), iodine number (I N) according to the Hanus method (Paquot, 1979) and fatty acids (C14:0, C16:0, C18:0, C18:1, C18:2) by the method of Arrendale, Chapman & Chortyk (1983) after methylation (Christopherson & Glass, 1969).

A number of samples were missed by the abattoir personnel leading to unequal treatment group numbers. The least squares model of Harvey (1977) was consequently used to handle unequal cell sizes in an analysis of variance. The least squares means of the results are presented in Table 2.

The only significant sex effect found was in myristic acid (C14:0) content where gilts had a slightly higher (0,1%) value than boars ($P<0,001$). Smithards, Smith & Ellis (1980) found that gilts had significantly less total unsaturated fatty acids although there were no significant differences in any particular fatty acid, including myristic acid.

A slight, but highly significant ($P<0,001$), difference in linoleic acid (C18:2) content between the dietary

Table 2 Least squares means of fatty acid composition, refractive index (R I), saponification value (S V) and iodine number (I N) of backfat as influenced by diet, sex or slaughter mass.

Fatty acid	Diet		Sex		Slaughter mass(kg)	
	Maize	Wheat	Boars	Gilts	85	120
C14:0	2,2	1,3	1,2	1,3[c]	1,3	1,2[c]
C16:0	30,0	30,8	30,3	30,5	30,6	30,3
C18:0	15,8	16,3	16,2	15,9	15,5	16,6[a]
C18:1	42,1	42,4	41,8	42,7	41,5	43,0[b]
C18:2	11,0	9,4[c]	10,6	9,8	11,2	9,1[c]
R I	1,4588	1,4585[b]	1,4586	1,4587	1,4588	1,4585[a]
S V	206	208	208	206	207	207
I N	60,1	56,4[a]	58,0	58,5	57,7	58,8

[a] $P<0,05$; [b]$P<0,01$; [c]$P<0,001$

treatments was observed. The pigs on the maize-based diet had a higher linoleic acid content (11,0%) indicating a less saturated fat than the pigs on the wheat-based diet (9,4%). This was also substantiated by the refractive index where the maize-based diet resulted in a value of 1,4588 compared to 1,4585 ($P<0,01$) and by iodine number where maize resulted in a value of 60,1 compared to 56,4 ($P<0,05$).

Except for palmitic acid (C16:0), where there was no significant difference due to slaughter mass, the relative concentrations of the other fatty acids invariably changed with mass. Myristic acid (C14:0) decreased from 1,3% at 85 kg to 1,2% at 120 kg; stearic acid (C18:0) increased from 15,5% to 16,6%; oleic acid (C18:1) increased from 41,5 to 43,0% and linoleic acid (C18:2) decreased from 11,2% to 9,1%. These changes were confirmed by a change in refractive index but not by the iodine number or saponification value.

Ericson, *et al.* (1980) found that Michigan soft white winter wheat and soyabean meal diets resulted in similar rates and efficiencies of gain and produced carcasses of similar composition and quality to diets containing maize and soyabean meal. They also found that pigs receiving wheat had significantly ($P<0,001$) higher percentages of myristic (C14:0), palmitoleic (C16:1), oleic (C18:1) and linoleic acids (C18:3) and a lower percentage of linoleic acid (C18:2) in the backfat than did pigs fed maize-based diets. Furthermore, Villegas, Hedrick, Veum, McFate & Baily (1973) found that linoleic acid was the most responsive to diet which was a possible reason why only linoleic acid showed a significant response in the present study.

It can be concluded that wheat as a grain source results in better backfat quality than maize when measured in terms of linoleic acid content, that sex has a minor effect on backfat composition and that heavy baconers have a more saturated backfat composition than ordinary baconers. The suggestion from the processing industry that heavy baconers (130 kg live mass) have a poor quality fat compared to 85 kg pigs, was not substantiated.

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