

STUDIES CONCERNING NUTRITIONAL METHODS TO IMPROVE PIG MEAT QUALITY

STUDII PRIVIND METODELE NUTRITIONALE DE ÎMBUNĂTĂȚIRE A CALITĂȚII CARNII DE PORC

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The purpose of the investigation was to determine the qualitative influence of the compound feed given during the fattening-finishing stage to Large White pigs. The experiment used 36 pigs assigned to three groups (C, E1 and E2) which differed by the dietary quality indices: C, E1 with 16.33% CP and 3202 kcal ME, during the first stage and 15.19% CP and 3100 kcal ME during the second stage; and E2 with 15.05% CP and 2940 kcal ME during the first stage and 14.06% CP and 2908 kcal ME during the second stage. Groups C and R2 had free access to the feed, while group R1 received 75% of the amount given to C. These nutritional methods improved significantly meat quality in groups R1 and R2: 53.51% and 53.61% carcass muscle percentage for groups R1 and R2 (EUROP class U) compared to just 49.14% for group C (EUROP class R).

Keywords: fattening-finishing pigs, meat quality, carcass, nutrition

Introduction

Food quality is presently of great concern for the consumers, which requires a review of meat production according to the economic context and market demands.

Over the last 40 years animal performance and chemical body composition were much improved due to genetic selection and to a better knowledge of their nutritional requirements. Thus, in pigs, the subcutaneous adipose tissue decreased but this decrease must not further influence the intramuscular fat level linked to meat sensorial qualities.

The change of the dietary lipid level can improve the nutritional quality of meat lipids. Lipid synthesis is mainly done in pigs in the adipose tissue, while in other species (poultry) it is done mainly in the liver. Before weaning it may be located in the liver, but it is less important (Jakubowski, 2006). The potential of the lipogenic enzymatic activity in the adipose tissue increases up to weaning peaking

between 40-70 kg particularly in the meat-type pigs (Anderson and Kauffman, 1973; Henry, 1977; Ganderner, 1998; Wood, 1999; Mourot, 2001).

Carcass grading in the EU is done according to the EUROP system based on the muscle percentage in the carcass. In Romania, pig carcass grading is done according to Order 457 approving the Technical norms for pig carcass grading.

The use of this system has several advantages in terms of meeting consumer demands for carcasses with high proportions of lean meat, meeting processing industry demands for low fat carcasses and in terms of higher feeding efficiency by reducing feed intake knowing that it takes less energy to produce a kilo of meat than a kilo of fat (1:2 ratio).

According to the EUROP system, pig carcasses are graded according to 5 classes according to the (lean) meat percentage:

<i>Percentage of muscle tissue in the carcass</i>	<i>Class</i>
➤ 55% and above	E
➤ 50% or more, but less than 55%	U
➤ 45% or more, but less than 50%	R
➤ 40% or more, but less than 45%	O
➤ less than 40%	P

The purpose of the paper is to determine the influence of three different (quantity and quality) compound feeds formulations given to fattening-finishing Large White pigs on pig performance and meat quantity and quality.

Materials and Methods

The experiment was conducted in the experimental farm of IBNA Balotesti on 36 fattening-finishing Large White pigs during 80 days (first period 50 days, second period 30 days) in January – March, assigned to three groups (C, E1 and E2) with 12 pigs each.

Tables 1 and 2 show the compound feed formulations with variable levels of dietary energy and protein (lower for E2), while R1 received a restricted amount of feed, 75% of the amount given to C. Compound feeds formulations were changed after 50 experimental days.

Protein to energy ratio (Tables 1 and 2) was close in all groups and for both experimental periods (50.94 g/1000 kcal during the first period and 49.03 g/1000 during the second period in groups C and E1 and 52.07 g/1000 kcal during the first period and 48.62 g/1000 kcal during the second period in group E2) .

The groups were homogenous as body weight, the average initial weight being 45.86 kg. The animals were housed 12 per pen and per group and had similar environmental conditions. The pigs had free access to the water and compound feed (powder), which was administered by hand.

The trial used meat-type pigs according to the following design:

- C □ had free access to the feed: formulation 0-3 during the first 50 days and formulation 0-4 during the subsequent 30 days

- E1 □ received the same diet as C but only 75% of the amount given to C
- E2 □ had free access to the feed but the dietary quality parameters were lower than in C and E1

Table 1.
Compounds feed formulation and quality for the first period

Item	C-E1	E2
Corn	67.55	46.44
Barley	-	25.00
Sunflower meal	2.00	10.00
Soybean meal	14.50	8.50
Full Fat soybean	10.30	4.50
Lysine	0.39	0.18
Premix choline	0.10	0.10
Monocalcium phosphate	2.60	2.45
Feedgrade limestone	1.26	1.43
Salt	0.30	0.40
Vitamin-Mineral Premix	1.00	1.00
Total	100.00	100.00
ASSAYED		
ME (Kcal/kg)	3202	2940
CP%	16.33	15.05
Protein to energy ratio (g:1000 kcal)	50.94	52.07
Lysine, %	1.11	0.8
Methionine + cystine, %	0.57	0.55
Calcium, %	1	1
Phosphorus, %	0.85	0.8

Table 2

Compounds feed formulation and quality for the second period

Item	C-E1	E2
Corn	68.30	53.27
Barley	-	22.00
Soybean meal	10.00	10.00
Full Fat Soybean	9.00	9.00
Sunflower meal	6.00	-
Lysine	0.25	0.15
Premix choline	0.10	0.10
Monocalcium phosphate	2.55	2.67
Feedgrade limestone	2.40	1.41
Salt	0.40	0.40
Vitamin-Mineral Premix	1.00	1.00
Total	100.00	100.00
ASSAYED		
ME (Kcal/kg)	3100	2908
CP%	15.19	14.06
Protein to energy ratio (g:1000 kcal)	49.03	48.62
Lysine, %	0.9	0.80
Methionine + cystine, %	0.56	0.5
Calcium, %	1.4	1
Phosphorus, %	0.85	0.86

Measurements and statistical calculation

The animals were weighed individually at the beginning of the experiment, at 50 and 80 days, when the dorsal fat thickness, the area of Longissimus dorsi and the meat percentage of the carcass were determined on live animals using an ultrasound PIGLOG 105.

Anova and Student tests were used to determine the homogeneity of sample and variance average values. The experimental results were interpreted and the conclusions were drawn. The following parameters were monitored during the experiment:

Quantitative parameters:

- Body weight evolution, total and per period (50 days, 30 days);
- Average daily weight gain (individual, period 1, period 2, overall period);
- Feed intake (average daily intake, per period and overall period);
- Feed conversion ratio per period.

Qualitative parameters:

- Fat thickness
- Eye muscle area;
- Average meat percentage of the carcass and EUROP grading.

Results and Discussions

Pig performance

The experiment was 2×2 bifactorial. The average body weight (Table 3) at the end of the first fattening period was 79.25 kg in group C, significantly higher ($P<0.05$) compared to E1 (70.83 kg) and E2 (72.50 kg). The same significant difference was observed in the end of the experiment (102.67 kg group C; 91.25 kg group E1 and 93.50 kg group E2).

Table 3

Body weight dynamics

Item	C	E1	E2
Initial weight	45.92	45.83	45.83
Weight at 50 days*	79.25 ^a	70.83 ^b	72.50 ^b
Final weight*	102.67 ^a	91.25 ^b	93.50 ^b

*different superscripts, significant differences between groups ($P<0.05$)



Significant differences ($P<0.05$) were also noticed in the average daily gain (Table 4). Thus, group C gained 0.667 kg during the first period and 0.782 kg during the second period, compared to 0.500 kg and 0.681 kg for group E1, and 0.533 kg and 0.700 kg for group E2, during the first and second periods, respectively.

Table 4

Average daily gain (kg)

Item	C	E1	E2
Period I*	0.667 ^a	0.500 ^b	0.533 ^b
Period II*	0.782 ^a	0.681 ^b	0.700 ^b
TOTAL*	0.711 ^a	0.568 ^b	0.596 ^b

* different superscripts, significant differences between groups ($P<0.05$)

The average daily compound feed intake overall experimental period was 2.94 kg in group C, 2.24 kg in group E1 and 2.18 kg in group E2 (Table 5). The average daily compound feed intake was lower in group E2 even though the animals had free access to the feed, maybe due to the lower palatability of the barley-based compound feed.

Table 5

Average daily compound feed intake (Kg)

Item	Period I (50 days)	Period II (30 days)	TOTAL
C	2.79	3.19	2.94
E1	2.15	2.41	2.24
E2	1.99	2.49	2.18

Feed conversion ratio (Table 6) correlated to the average daily compound feed intake and to the average daily gain was 4.19 kg compound feed per kg gain in group C during period 1 and 4.08 during period 2, compared to 4.30 and 3.54 for group E1 and 3.73 and 3.56 for group E during periods 1 and 2, respectively.

Table 6

Feed conversion ratio (kg compound feed /kg gain)

	Period I (50 days)	Period II (30 days)
C	4.19	4.08
E1	4.30	3.54
E2	3.73	3.56

The meat percentage of the carcass (Table 7) was 49.14% in group C, 53.51% in group E1 and 53.61% in group E2. The differences were not statistically significant. These values grade C group carcasses in class U and E1 and E2 groups carcasses in class U, the price difference being considerable.

Eye muscle area was similar in all three groups and the differences were not statistically significant ($P < 0.10$).

Fat thickness was significantly lower in groups E1 and E2 (16.30 mm and 16.44 mm, respectively), compared to group C (21.25 mm).

Table 7

Carcass quality parameters

Item	C	E1	E2
Carcass meat (%)	49.14 ^a	53.51 ^a	53.61 ^a
Eye muscle area (cm ²)	41.30 ^a	43.33 ^a	43.11 ^a
Fat thickness* (mm)	21.25 ^a	16.30 ^b	16.44 ^b

* different superscripts, significant differences between groups ($P < 0.10$)

If the body weight and average daily gain were significantly improved by the dietary energy and protein level of group C, the fat thickness was significantly higher in this group too and the meta-fat percentage graded these carcasses in a lower class. These data support the results of Hebean et al. (2003) and Hăbeanu (2004), when the higher average daily gain of the Large White × LSP 345 hybrid resulted in a lower meat percentage in the carcass compared to Duroc pigs.

The meat percentage of groups E1 and E2 is close to the results reported by S.C. Romsuintest Periș S.A. in Large White pigs (54.5%, Zeneci, 2002).

Conclusions

The amount and quality of the compound feed given to fattening pigs influenced pig performance and meat quality:

- Body weight and average daily gain were significantly in group C which received higher dietary energy and protein levels and whose pigs had free access to the feed.;
- The average meat percentage in the carcass was influenced by the dietary treatment as follows:
 - C ranked in R class, with the poorest meat-fat ratio 49.34%;
 - E1 and E2 ranked in class U with a meat-fat ratio of 53.51% and 53.61%, respectively;
- The fat layer was significantly thicker in group C than in groups E1 and E2.

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Obiectivul este de a stabili influența cantitativă și calitativă a nutrețului combinat administrat în faza de îngrășare –finisare la porci din rasa Marele Alb. În acest sens, s-au utilizat 36 animale repartizate în trei loturi experimentale (M, R1 și R2) diferențiate prin indicii calitativi ai furajului M, R1 cu 16,33% PB și 3202 kcal EM , în prima perioadă și 15,19% PB și 3100 kcal EM în a doua perioadă față de R2 cu 15,05% PB și 2940 kcal EM în prima perioadă și, respectiv 14,06% PB și 2908 kcal EM .în a doua perioadă. Loturile M și R2 au primit nutreț combinat la discreție iar, lotului R1 i s-a administrat 75% din cantitatea lotului M. Aceste metode nutriționale au permis îmbunătățirea calității cărnii la loturile R1 și R2 cu un raport de carne în carcasă de 53, 51% și, respectiv 53,61% ce a dus la încadrarea în clasa U conform sistemului EUROP comparativ cu lotul M care s-a încadrat în clasa R, cu un raport carne în carcasă de 49,14%. Performanțele productive au fost afectate semnificativ în cazul loturilor R1 și R2.

Cuvinte cheie: suine la îngrășare –finisare, calitatea cărnii , carcasă, nutriție