

18.5 p. 100 of the DM during the growing period (up to 58 kg) and from 14.1 to 15.8 p. 100 during the finishing period (up to 102 kg). The lysine levels varied similarly between 0.95 and 1.06 p. 100, then between 0.75 and 0.83 p. 100. No significant interaction was observed between the effects of protein and those of lysine on performance or on carcass yield. During the growing period, the increased lysine supply from 2.77 to 3.16 g/1 000 Kcal DE led to a highly significant improvement of the daily mean gain (683 to 712 g/d) and of the feed conversion ratio (2.13 to 2.05 for DM and 7.19 to 6.86 Mcal for DE). Opposite to that, the protein level did not affect the performance. During the finishing period, the minimum protein and lysine levels were sufficient to obtain the maximum growth rate of 760 g/d fixed by the feed restriction plan, i.e. : 1 850 g feed supplement and 16 l whey. During the growing and the finishing period no difference was observed between males and females. However, this difference was highly significant as regards the carcass characteristics : females exhibited a lean and bone percentage of 53.6 p. 100 versus 51.5 p. 100 in males, and a fat percentage of 38 p. 100 versus 40.4 p. 100. Lysine significantly increased the ham weight (+ 500 g), while the highest protein levels increased the lean percentage (52.1 to 53.0 p. 100). Increase in the protein and lysine levels had a beneficial effect on meat quality. The highest lysine levels led to a water loss reduction.

Effect of skim milk powder in weaning diets for piglets

Role of the dietary protein level

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Six trials were made in 580 piglets weaned at three weeks to test the effect of the incorporation of skim milk powder in two diets containing 18 and 22 p. 100 crude protein, respectively. The diets were offered *ad libitum* in the form of pellets during the first fortnight following weaning (1st age). Whatever the diet, the feed intake and live weight gain tended to increase with the initial weight at weaning. However, this did not improve systematically the feed efficiency. There was no significant relationship between the effects of milk powder and those of the crude protein content. The incorporation of skim milk powder did not modify the feed intake, but improved significantly the live weight gains as well during the first age as during the whole experimental period (+ 5 p. 100). The feed efficiency was also improved by 5 p. 100. The increase in the crude protein content of the diet had a favourable effect on the daily weight gain and feed efficiency which was as marked as that of the milk powder, but it did not affect the feed intake.

Long-term effects of reducing the protein level in a simplified weaning diet for piglets

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A total of 180 piglets from 30 litters weaned between the age of 19 and 25 days were reared individually from weaning to slaughter. Six 1st age diets were compared

during an average period of 20 days. The protein supply was reduced according to three different modalities :

(1) Diets 22 (0) and 18 (0), cereals (barley, wheat, maize) - soyabean meal non supplemented with lysine, without milk powder.

(2) Diets 22 (15) and 18 (10) including 15 and 10 p. 100 milk powder, respectively allowing a 30 p. 100 reduction of the soyabean meal.

(3) Diets 22 (+) and 18 (+) corresponding to a supplementation of diets 22 (0) and 18 (0) supplying the same amount of lysine as diets 22 (15) and 18 (10), respectively.

During the second age (up to 25 kg live weight within the same litter) diet 22 (0) including 22 p. 100 protein and 1.2 p. 100 lysine was offered *ad libitum*. After transfer to the fattening house pigs were fed according to a progressive restriction plan a standard diet including 17 p. 100 protein and 0.85 p. 100 lysine. The animals were slaughtered at 101.4 (\pm 2.3 kg) live weight on an average and the lean percentage of the carcasses was estimated on the basis of linear measurements. During the 1 stage period, reduction of the protein level led to a significant decrease in the weight gain, i.e., 25 and 15 p. 100, respectively with treatments (1) and (2). Conversely, the weight gain increased by 14 and 33 p. 100 when incorporating 15 and 10 p. 100 milk powder to the weaning diet including 22 and 18 p. 100 protein, respectively. The effects of lysine supplementation (treatment 3) were not significant whatever the protein level of the diet. When leaving the post-weaning house, reduction of the protein level in the initial diet led to a significant decrease in the piglet weight, i.e., 1.15 and 1.55 kg, respectively with treatments (1) and (2). At this stage a 1.15 kg increase in the live weight was due to the incorporation of milk powder in the weaning diet including 22 p. 100 proteins. The advantage of diet 22 (15) was maintained until slaughter resulting in significant reductions of the production length, i.e., 3.6 days as compared to diet 22 (0) and 6.1 days as compared to diet 18 (0). The carcass yields (p. 100 of the live weight) and lean yields (p. 100 of the carcass weight) were not affected by the characteristics of the weaning diet. In these experimental conditions, use of milk powder would be advantageous at an approximate minimum price of 7.25 F/kg as compared to that of soyabean meal and cereals (2.50 F/kg and 1.40 F/kg, respectively). Our results compared to other data suggest that it is not advisable to lower the protein level of the weaning diet for piglets without maintaining a very high protein quality. Accordingly, use of proteins rich in essential amino acids is undoubtedly better than a mere supplementation of soyabean meal.

Amino acid digestibility : use of the ileo-rectal shunt technique in pigs

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The surgical procedure described in this paper was used to collect digesta from the distal small intestine without any cannulation. The terminal ileum was cut and fitted to the side of the descending colon just before the rectum (FULLER & LIVINGSTONE, 1983). The ileal juices were obtained from the anus. Growing pigs of 20 kg live weight recovered very well after the operation and could be used for several months. The amino acid digestibility data obtained are in keeping with those derived from classical methods (ileo-caecal re-entrant cannulas).