

contained barley associated with skim-milk powder (15 p. 100), Norwegian herring meal (9 p. 100) and soybean oil-meal (15 p. 100). Replacement of the skim-milk by an association of 5.8 p. 100 soluble fish protein concentrate (SFPC 90) and manioc (group 2) did not lead to any change in the zootechnic performances (352 and 314 g/day) and nitrogen retention coefficient (NRC = 61.8 and 58.7 p. 100). Increase of the SFPC 90 level to 15 p. 100 as a replacement of two protein sources in the control diet, skim-milk and herring meal (group 3) or herring meal and soybean oil-meal (group 4) tended to reduce by 16 to 17 p. 100 the feed intake level and growth performances of the animals kept on the floor. Conversely, when these two diets were offered to piglets kept in cages and receiving equalized quantities of the feeds, the growth performances and nitrogen retention recorded (NRC = 60.4 and 59.4) were the same as those of the controls. At the same level of replacement (15 p. 100), the association of SFPC and Norwegian herring meal led to a supplementary lowering (21 p. 100) of the growth rate on the floor, the nitrogen retention coefficient (NRC = 50.8) being then significantly lower than that of the control diet.

The growth rate and nitrogen retention in the animals kept on the floor were minimum when SFPC 90 constituted the sole protein supplementation of barley. It may be concluded that the results confirm the excellent digestibility of soluble fish protein, but total replacement of the skim-milk seems only to be possible if a sufficient amount of tryptophan is supplied. Thus, soyabean oil-meal can only be used in limited amounts because of its depressive effect on digestibility, but appears to be necessary for the amino acid balance of the diet.

Protein supply of piglets weaned at three weeks

II. --- EFFECT OF INCORPORATING A MAIZE PROTEIN CONCENTRATE ON THE APPARENT DIGESTIBILITY OF THE DIET AND THE NITROGEN BALANCE OF THE PIGLET

B. SÈVE and A. AUMAITRE

*Station de Recherches sur l'Élevage des Porcs, I. N. R. A., C. N. R. Z.,
78350 Jouy en Josas*

Utilization conditions of a maize protein concentrate (MPC) in a 3 weeks-weaning diet were determined according to nitrogen balance data of 30 animals from 5 different litters, *i. e.* 5 replications of 6 treatments. On the basis of a control diet based on barley and containing skim-milk (15 p. 100), Norwegian herring meal (9 p. 100) and soyabean oil-meal (15 p. 100), 5 experimental isonitrogenous diets were composed: two diets including 5 and 10 p. 100 of MPC, the protein of which replaced that of the skim-milk (groups 2 and 3) and three diets containing 5, 10 and 15 p. 100 MPC in replacement of herring meal protein. In each replication the piglets received equal amounts of the different diets. The digestive and metabolic balances concerned six consecutive periods of 5-7 days each and located between the ages of 21 and 58 days.

When the MPC replaced skim-milk protein, the apparent digestibility of the diet was not affected, but a linear lowering of the nitrogen retention coefficient (NRC 66.6, 65.1 and 61.6 for the groups 1, 2 and 3) and of the amount of nitrogen retained per day was noted, although the growth rates did not significantly differ from that of the control group.

When the MPC replaced herring protein, the apparent digestibility of the diet significantly

increased in the case of dry matter or organic matter (apparent digestibility coefficient (ADC) = 87.3 and 89.0 for groups 1 and 6). The digestibility of nitrogen increased in the same proportions, but in a significant way (ADC = 83.6 and 85.4 in the same groups). Conversely, and like in the case of replacement of skim-milk protein, the nitrogen retention coefficient (NRC = 66.1, 65.5, 61.5 and 59.9 in the groups 1, 4, 5 and 6) and the amount of nitrogen retained per day significantly decreased parallel to the weight gain (312, 311, 299 and 285 g/day in the groups 1, 4, 5 and 6). This lowering of protein efficiency may be explained by the decrease in the lysine level of the diet after introduction of MPC (1.52 p. 100 of lysine in the control diet, 1.34 p. 100 of lysine in the diet containing 10 p. 100 MPC and 1.26 p. 100 in that containing 15 p. 100 MPC). The maize protein concentrate studied has the advantage of being remarkably digestible, but its utilization must be limited because of the risks for amino acid imbalance : tryptophan, leucine/ isoleucine ratio and especially low lysine level. Furthermore, the present results suggest that the minimum lysine level of 3-weeks-weaning diets must range about 1.45 p. 100 in the conditions of practice.

**Utilization of cane sugar molasses in pig feeding.
Influence of a high dietary energy content on piglet performances;
metabolic utilization of nitrogen in pigs of 35 kg**

J. LE DIVIDICH and I. CANOPE

*Station de Recherches zootechniques, I. N. R. A.,
C. R. A. A. G., Domaine Duclos,
97170 Petit Bourg (Guadeloupe)*

Two trials were made on 60 *Large White* pigs with a view to studying the following parameters :

- influence of a tallow supplementation of diets based on cane sugar molasses on the performances of piglets between 5 and 9 weeks of age ;
- influence of increasing levels of molasses (0, 20 and 40 p. 100) on the apparent digestibility and metabolic utilization of nitrogen in pigs of 35 kg, placed in digestibility cages.

Addition of 7.5 and 15 p. 100 tallow to piglet diets brought about a linear reduction in the digestibility of dry matter ($P < 0.05$), organic matter ($P < 0.05$) and energy ($P < 0.05$) of the diet. The growth performances were also significantly reduced because of a decrease in the intake of crude protein and digestible energy. On the other hand, the feed efficiency (kg gain/kg feed) increased with the tallow level of the diet.

In pigs of 35 kg, the increase in the molasses content of the diet was accompanied by a reduction of the digestibility of dry matter ($P < 0.05$), organic matter ($P < 0.05$) energy ($P < 0.05$) and especially crude protein ($P < 0.05$). This resulted in a decrease in the daily nitrogen retention ($P < 0.05$) although no significant effect of molasses on the nitrogen retention coefficient was noticed.