

of protein. The legume seeds were introduced at levels of 15 and 30 p. 100 into diets based on maize (16 p. 100 crude protein and 3 300 kcal digestible energy/kg) and rebalanced with tryptophan to satisfy the requirements (0.15 p. 100) by addition of soyabean meal.

Sixty *Large White* pigs were divided into 5 groups of 12 animals (6 castrated males and 6 females) according to the following experimental scheme :

- - Group 1 : control diet : maize (73 p. 100) soyabean meal (21 p. 100).
- Group 2 : maize (65 p. 100) peas (15 p. 100) soyabean meal (14 p. 100).
- Group 3 : maize (53 p. 100) peas (30 p. 100) soyabean meal (11 p. 100).
- Group 4 : maize (67 p. 100) horse beans (15 p. 100) soyabean meal (12 p. 100).
- Group 5 : maize (58 p. 100) horse beans (30 p. 100) soyabean meal (6 p. 100).

The pigs, kept in individual pens, received the feed in form of pellets in one only meal per day, according to a feeding schedule depending on live weight. The same diet was offered during the overall fattening period from 24 to 100 kg live weight.

Under our experimental conditions, introduction of peas or horse beans into the diets in a proportion of 15 and 30 p. 100 respectively, led to obtention of high performances as compared to those recorded with the control diet (maize-soyabean meal) : growth rate (g/d) and feed conversion ratio (kg air dry feed/kg gain), respectively : group 1 : 692, 3.08 — group 2 : 685, 3.11 — group 3 : 678, 3.17 — group 4 : 684, 3.12 — group 5 : 687, 3.08 from 24 to 100 kg live weight. Likewise, for all body composition criteria, the statistical analysis of the results did not show any significant difference between the groups.

The findings of this study show that the use of peas and horse beans shall not only be considered in terms of total replacement of soyabean meal as the legumes also substitute for large fraction of cereals. Besides, the presence of soyabean meal appeared to be necessary, notably as a source of tryptophan ; this supplementation leading to an optimum valorization of the legumes. Under these conditions, peas and horse beans can be used in pig diets at an incorporation level of 15 and even 30 p. 100 during the whole growing period.

## Nutritive value of animal by-products (keratin, gelatin) for growing-finishing pigs

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This study was made in order to estimate the nutritive value of keratin (horn meal) and gelatin (pig skin meal) as partial replacers of soyabean meal in cereal based diets.

The horn meal used was a product dried in hot air (135-140°C) for 24 hours, ground and sifted. Part of the product was used in this form, the rest subjected to ultragrinding leading to reduction of the particle size from 320 to 80  $\mu$ .

The gelatin studied came from pig skin meal subjected to various treatments (acidification, cooking). The chemical and amino acid composition of these products is reported.

For the « keratin » trials, the experimental schedule included 3 groups of 14 *Large White* pigs (7 castrated males, 7 females) subjected to lot trials between 30 and 100 kg live weight and 3 groups of 4 growing castrated males (30-35 kg) for studying digestibility. The diets used were the following :

Group 1 : control diet : cereals + soyabean meal.

Group 2 : replacement of 50 p. 100 soyabean meal by 4 p. 100 untreated « keratin ».

Group 3 : replacement of 50 p. 100 soyabean meal by 4 p. 100 ultraground « keratin ».

For the experiments on «gelatin», only 2 treatments were applied, *i.e.* 2 groups of 28 *Large White* pigs (14 castrated males, 14 females) for the lot trials between 30 and 100 kg live weight and 2 groups of 4 growing male pigs for the digestibility study. The diets used were the following :

Group 1 : Control diet : cereals + soyabean meal.

Group 2 : Replacement of 50 p. 100 soyabean meal by 4 p. 100 gelatin.

For the lot trials, the pigs were kept in collective pens including 7 animals of the same sex fed according to the following feeding schedule : a 17 p. 100 protein diet during the growing period (30-60 kg live weight) and a 15 p. 100 protein diet during the finishing period (60-100 kg live weight).

The pigs used in the digestibility study received only the « growing diet » (paired feeding) and were subjected to a collecting period of 10 days.

With diets relatively rich in crude protein, replacement of half of the soyabean meal by 4 p. 100 horn or gelatin meal did not bring about any marked lowering of the animals' performances.

Although pig skin meal has a well balanced amino acid composition for the pig, its digestibility is low (about 60 p. 100) and definitely lower than that of soyabean protein. Ultragrinding did not improve digestibility and retention of these proteins.

Conversely, in the case of gelatin digestibility was high, but its supplementation value was low because of severe amino acid imbalances.

The fact that under our experimental conditions the influence of partial replacement of soyabean meal by 4 p. 100 horn meal or gelatin meal was almost non existent was probably due to the low performances recorded and to the relatively high protein level of the diets masking the amino acid imbalances of the latter.

### Rapeseed meal for the growing pig. Preliminary results of a detoxification process in silage

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Rapeseed meal, despite the high quality of its proteins, is of little use in pig feeds, because of its unpalatability and toxicity even at low levels.

The undesirable substances, *i.e.* vinylthioazolidone (VTO) and isothiocyanates (ITC) can be economically eliminated by fermentation. Mixing of ear corn with husks (50 p. 100 D.M.) and rapeseed meal (2:1 D.M. basis) leads to a strong lactic fermentation with a limited protein and aminoacid degradation (2 p. 100 of the nitrogen content as ammonia) a total ITC and high VTO elimination.

Fed to 55 kg pigs, this silage rich in crude fiber was ingested at the same DM level as an isonitrogen isocellulose mixture of corn silage, soyabean meal and straw provided semi *ad libitum*. Growth rate (500 g/d) and thyroid weight measurements showed no ill effect of a 16 p. 100 (DM basis) rapeseed meal level in the ration of growing-finishing pigs.