WHITE PAPER – SUMMARY OF RESEARCH INTO PAPS IN PIG DIETS

Introduction

Processed Animal Proteins (PAPs) have been banned from diets of farmed animals in the EU for approximately 20 years. During this time processing techniques for animal proteins have changed and improved. Consequently, the specifications of products in feedstuff tables do not accurately represent the composition and quality of available PAPs.

From September 2021, amendments to the legislation will permit the feeding of porcine PAPs to poultry and poultry PAPs to pigs. This white paper summarises research and nutritional information for the use of poultry PAPs in pig feed.

Overview of research

The use of poultry PAPs in pig diets requires adequate knowledge of their nutritional value, but data in (European) feed tables are generally old and based on PAPs of unspecified animal origin. Wageningen Livestock Research, the European Fat Processors and Renderers Association (EFPRA) and several other industrial partners have conducted studies to provide up to date information on the nutritional content of PAPs.

A 2020 study provides new data on digestibility and nutritional value for the use of poultry based PAPs in pig diets, specifically three types of poultry meal, blood meal and feather meal. It analysed the total tract digestibility of proximate components and minerals, as well as the ileal digestibility of crude protein (CP) and amino acids (AA) of poultry PAPs 25–55 kg pigs.

In 2021, researchers will complete performance studies which will be added to this document in due course.

2020 Trials with pigs

Trial design

- 5 types of PAP tested: 3 poultry meals (wet melting process) varying in protein and mineral content, a feather meal and a poultry blood meal.
- Two periods: Period 1 (0-21 days), the diets were formulated to evaluate total tract Ca and P digestibility and in Period 2 (21-36 days) the diets were formulated to evaluate ileal AA and CP digestibility, together with total tract CP, organic matter (OM), crude fat (CFat) and gross energy (GE).
- A total of 48 gilts (Topigs EE linexLZline) were used, with 8 pigs per treatment group.

Composition of 3 poultry meals used in trials

	High mineral	Medium mineral	Low mineral
Total Soft Parts	30%	60%	80%
From turkeys	30%	30%	24%
From broilers	0%	30%	56%
Total Bone	70%	40%	20%
From turkeys	70%	20%	6%
From broilers	0%	20%	14%

Nutrition findings

- Low and medium mineral poultry meal were only marginally different in mineral (ash), protein and amino acid content.
- Low and medium mineral differed substantially from high mineral poultry meal in P and Ca content, but mineral digestibility was similar in the three products.
- The high mineral meal had the lowest crude protein and amino acid content. The ileal digestibility was equal or higher than in low and medium poultry meal. The high mineral contained a higher proportion of collagen protein as reflected by the amino pattern, e.g. a higher proline and hydroxyproline concentration.

- The composition of poultry PAPs is not adequately reflected in the CVB (2018) and INRA Feed Tables.
- For the limited number of PAPs in this study, the in vivo ileal protein digestibility seemed to correlate better to the in vitro pepsine digestibilty than the in vitro digestibility according to the Boisen-method.

Comparison of three poutry meals with feed table data

- The low and medium mineral poultry meal had higher protein and lower ash content than meat meal in the CVB (2018) table. Poultry meal in the INRA Feed Table has a low ash content and low to high protein content, but the amino acid pattern suggests the products may contain a substantial proportion of feathers.
- Total tract digestibility of crude protein was similar in the three meals, but digestibility of crude fat and energy were lower in the high mineral meal, possibly an effect of the high Ca content or because of a lower digestibility of fat from bone (marrow).
- The total tract digestibility of poultry meals was in the range of table values for mixed species animal proteins but the variation within this product group needs to be taken into account.
- The ileal digestibility of crude protein and amino acids of poultry meal were higher than the mixed species MBM in CVB (2018) and more in line with meat meal and INRA values for poultry meal.

Comparison of blood meal and feather meal with feed table data

- The P concentration in feather meal was below values in CVB and INRA feed tables. As a result, P-digestibility could not be accurately determined.
- Mean ileal protein and amino acid digestibility of feather meal was 60-65%. Overall, ileal digestibility was somewhat lower than in published data and cysteine digestibility was below that of other amino acids. The hydrolisation process and the relatively high proportion of turkey feathers may play a role.
- The amino acid pattern of poultry blood meal deviated substantially from table values of unspecified blood meal, with a relatively high isoleucine concentration. The P content in the poultry blood meal was higher than table values and may indicate a difference between species.
- Mean ileal protein and amino acid digestibility of blood meal was around 85%, close to table values. Published data vary substantially, presumably due to the drying process.
- The rate of digestion and absorption differed. The digestion and absorption of crude protein was relatively high in the proximal small intestine for blood meal and in the distal small intestine for feather meal.

Guidance for application of the results in the matrix for linear programming

	Type of poultry PAP				
	High mineral	**Medium Mineral**	**Low Mineral**	**Feather meal**	**Blood meal**
EU Processing method*	7	7	7	7	7
Composition (%)					
Protein	53.4	67.4	67.9	88.6	93.4
Fat	9.6	11.6	11.9	6.7	0.6
Ash	32.1	12.4	11.7	1.3	2.5
Digestibility coefficient of nutrients (%)					
Organic matter	74.9	83.3	81.7	73.6	79.5
Crude protein faecal	82.9	84.6	83.1	75.3	82.9
Crude protein ileal	79.4	65.6	73.1	60.8	84.4
Crude fat	52.7	83.0	81.1	65.0	-
Phosphorus	65.9	68.2	62.3	-	-
Ash	-	-	-	41.8	71.1
Digestibility coefficient of amino acids (%)					
AA ileal essential					38.42
Lysine	86.9	76.3	79.7	58.3	88.3
Methionine	78.5	82.7	83.5	55.2	88.9
Cystine	64.6	44.3	52.4	37.6	69.3
Threonine	71.5	68.3	70.9	61.4	84.9
Tryptophan	68.1	66.6	73.4	57.7	82.0
Arginine	87.9	84.5	86.8	78.9	89.2
Valine	75.6	70.8	76.5	75.0	82.7
Isoleucine	81.4	73.1	74.5	77.0	82.4
Leucine	86.1	74.0	79.7	75.5	83.0
Phenylalanine	81.0	72.7	76.7	79.4	82.1
AA ileal non-essential					
Alanine	83.6	73.5	77.4	71.1	85.1
Aspartic acid	67.2	42.6	49.4	43.0	83.6
Glutamic acid	80.5	71.3	71.5	60.4	85.5
Histidine	83.3	62.2	71.1	58.2	82.8
Proline	88.8	91.5	85.7	nd	nd
Glycine	70.3	67.7	64.5	66.5	83.1
Serine	67.4	63.8	67.6	70.5	86.0
Tyrosine	78.3	74.3	77.7	69.1	87.3
AID - 18 (ileal)	75.1	71.2	73.4	63.5	86.0