

Nutritional evaluation of Processed Animal Proteins in poultry

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Reasons for nutritional evaluation of PAPs

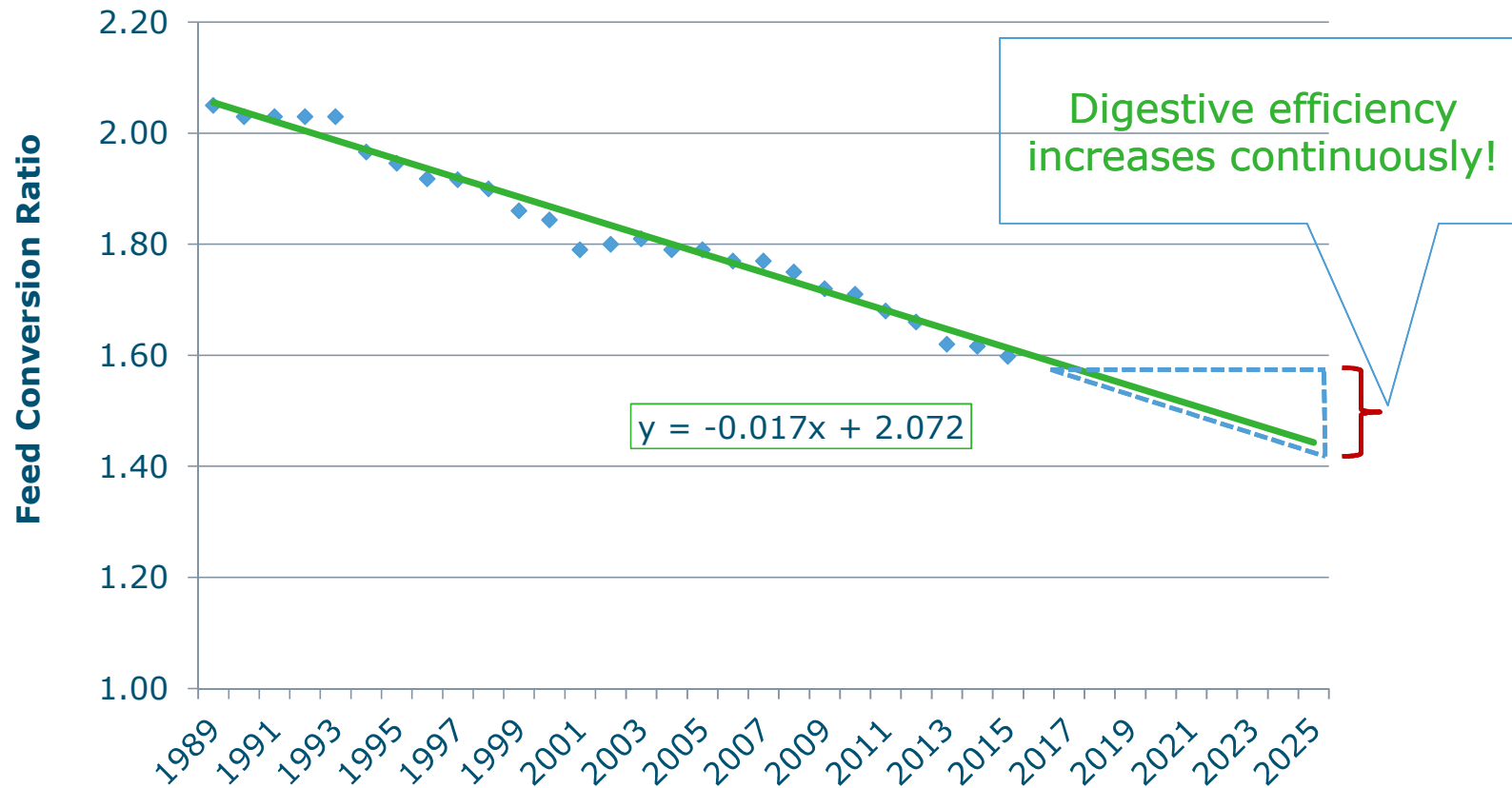
- Valuable protein, energy, and mineral source

| | CP (g/kg) | AME (MJ/kg) | P (g/kg) |
|------------------------|--------------|----------------|-------------|
| Pork meat meal (Dutch) | 581 | 13.0 | 22.8 |
| Soybean meal | 468 | 9.0 | 6.8 |



- Functional properties (e.g. promoting natural behaviour)?
- Ban on PAP in animal feed since December 2000 → reintroduction in e.g. poultry diets expected
- Changed PAP characteristics (processing methods)
- Changed genetic potential of poultry

Feed conversion ratio over time (corr. 2200 g BW)



EFPRA study: energy and protein digestibility in broilers

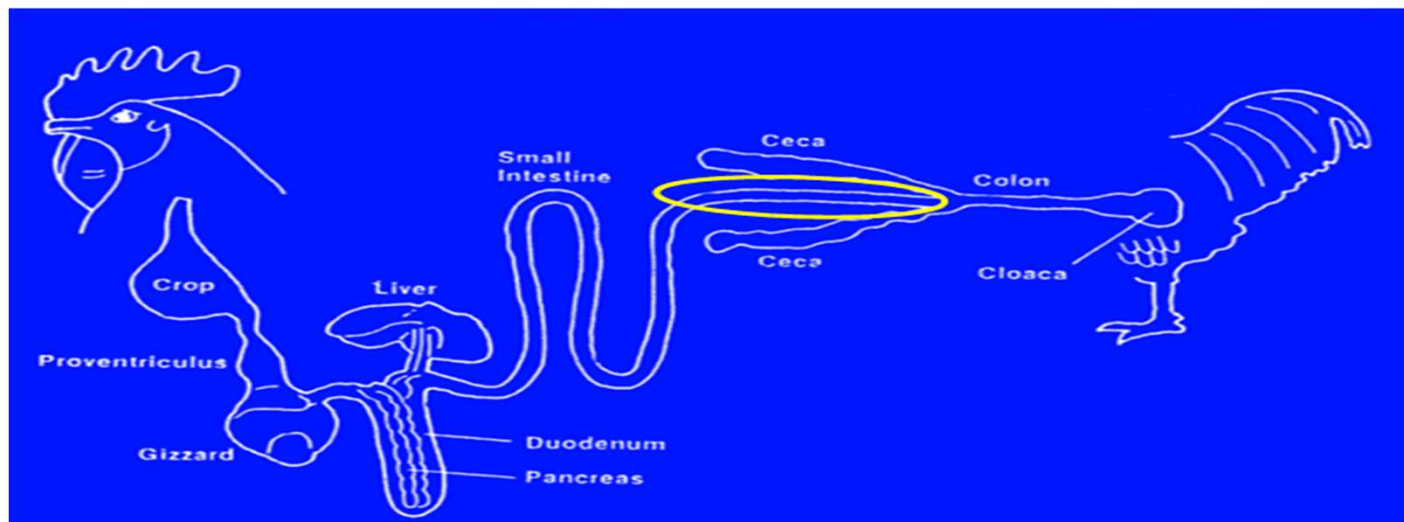
Pre-experimental period (0 -14 days)



Experimental period (14 – 23 days)

Digestibility study

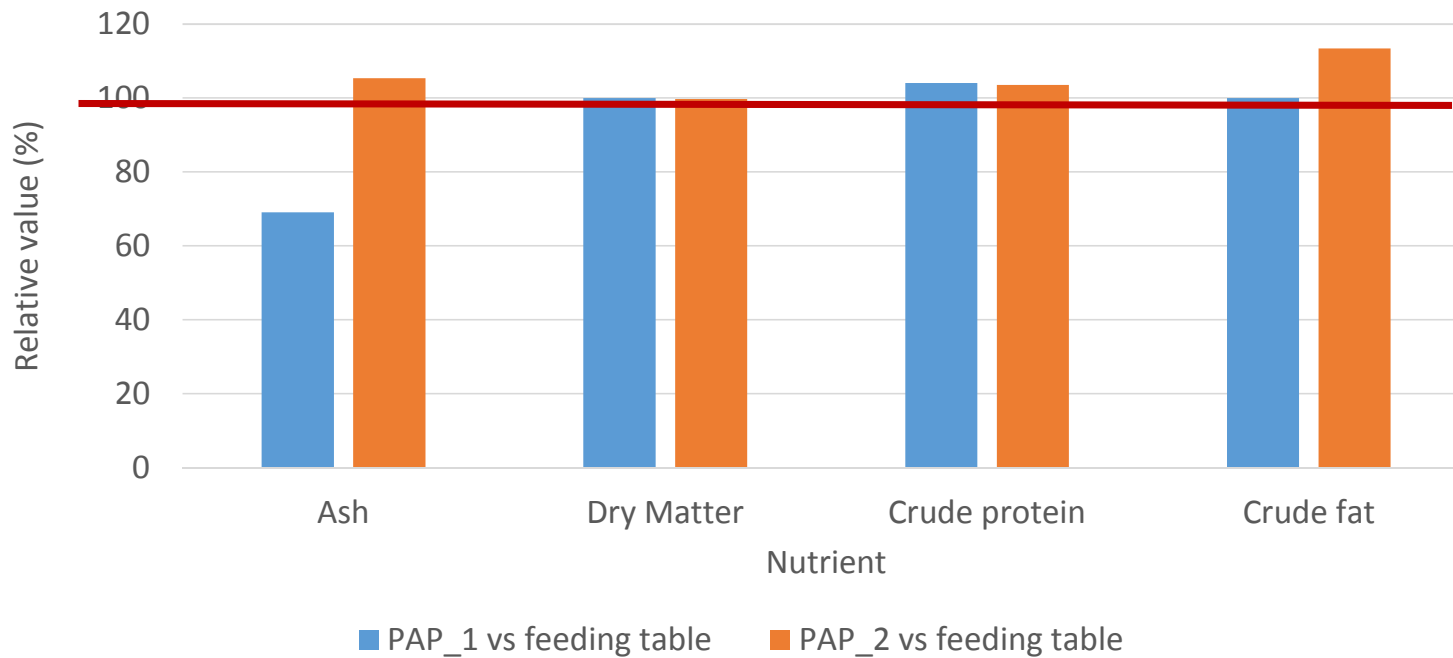
- Aim: to determine in PAP_1 and PAP_2 broiler diets:
 - total tract digestibility of proximate components
 - ileal phosphorus, calcium, amino acid digestibility
 - AME (metabolizable energy value)



PAP characteristics

| Parameter | Unit | PAP_1 | PAP_2 |
|---|------|-------------------------------|-------------------|
| Processing Method | | (1/ pressure & sterilisation) | (7 / mild method) |
| Dry matter | g/kg | 946 | 948 |
| Ash | g/kg | 121 | 233 |
| Phosphorus | g/kg | 19.3 | 41.9 |
| Calcium | g/kg | 28.3 | 78.0 |
| Crude fibre | g/kg | 40 | 16 |
| N Dumas | g/kg | 97 | 96 |
| Crude protein ($6.25 * N_{Dumas}$) | g/kg | 609 | 601 |
| Crude fat | g/kg | 144 | 101 |

Relative nutrients (%) PAP's vs. CVB (2007)



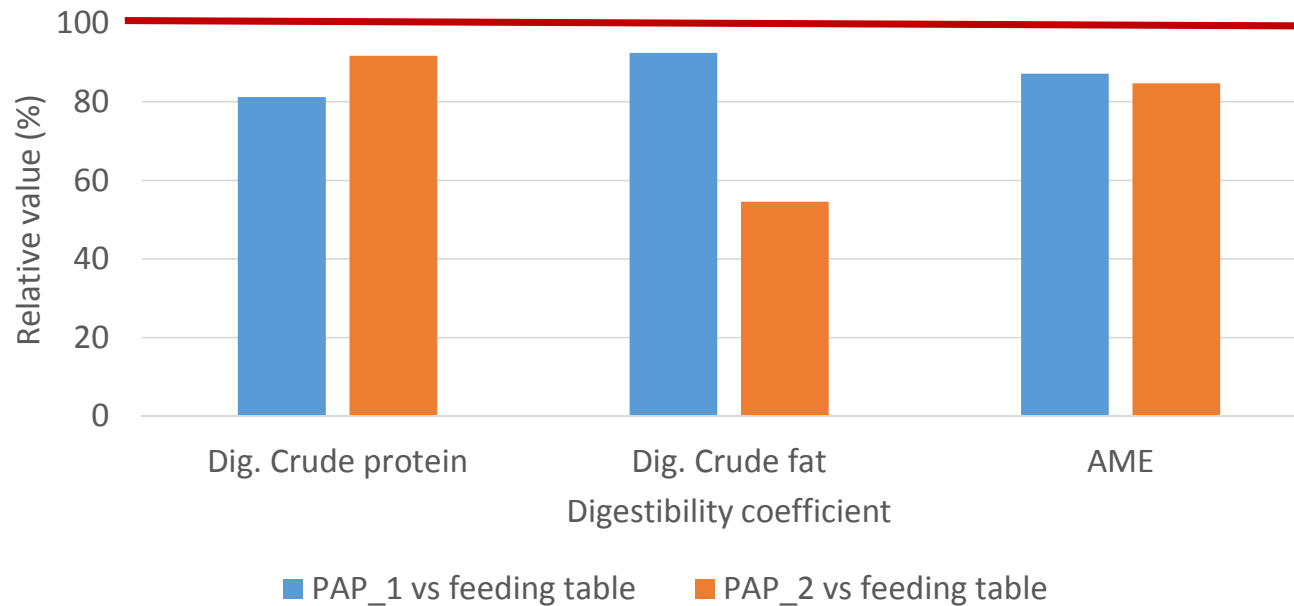
- PAP_1: Low in ash
- PAP_2: High in crude fat

Nutrient digestibility tested PAP's

| Nutrient | PAP_1 | PAP_2 | F prob |
|-----------------------------|-------------------|-------------------|---------------|
| Ileal digestibility | | | |
| Dry matter | 60.9 ^b | 76.6 ^a | 0.004 |
| Crude protein | 60.9 ^b | 68.8 ^a | 0.036 |
| Amino Acids (total) | 63.6 | 68.1 | 0.332 |
| Faecal digestibility | | | |
| Dry matter | 54.5 ^b | 65.6 ^a | 0.008 |
| Organic matter | 55.0 ^b | 67.1 ^a | 0.007 |
| Ash | 42.3 ^b | 52.2 ^a | 0.004 |
| Crude fat | 79.6 ^a | 47.2 ^b | <.001 |

- PAP_1: High in digestibility-% crude fat
- PAP_2: High in digestibility-% crude protein, amino acids

Relative digestibility (%) PAP's vs. CVB (2007)



- PAP_1: Nutrient digestibility \pm 90% of CVB value
- PAP_2: Fat digestibility 55% of CVB value
- AME: PAP_1 87% of CVB, PAP_2 85% of CVB

Digestibility of PAPs in laying hens

METABOLISM AND NUTRITION

Effect of four processed animal proteins in the diet on digestibility and performance in laying hens

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Digestibility study with pork meat meal

- 45% protein in the diet from pork meat meal
 - Sonac 50 (19% in diet)
 - Sonac 60 (16% in diet)
 - Daka 40 (22% in diet)
 - Daka 58 (16% in diet)
- Basal diet without animal protein (soybean meal)

Chemical composition of pork meat meals

| | | Sonac_60 | Daka_58 | Sonac_50 | Daka_40 |
|--------------|-------|----------|---------|----------|---------|
| Ash | g/kg | 183 | 252 | 336 | 437 |
| Protein | g/kg | 617 | 597 | 558 | 417 |
| Fat | g/kg | 117 | 118 | 96 | 99 |
| Calcium | g/kg | 52 | 82 | 116 | 161 |
| Phosphorus | g/kg | 30 | 42 | 59 | 77 |
| Gross Energy | MJ/kg | 19.8 | 18.9 | 16.1 | 13.6 |

Conclusion: large variation in chemical composition

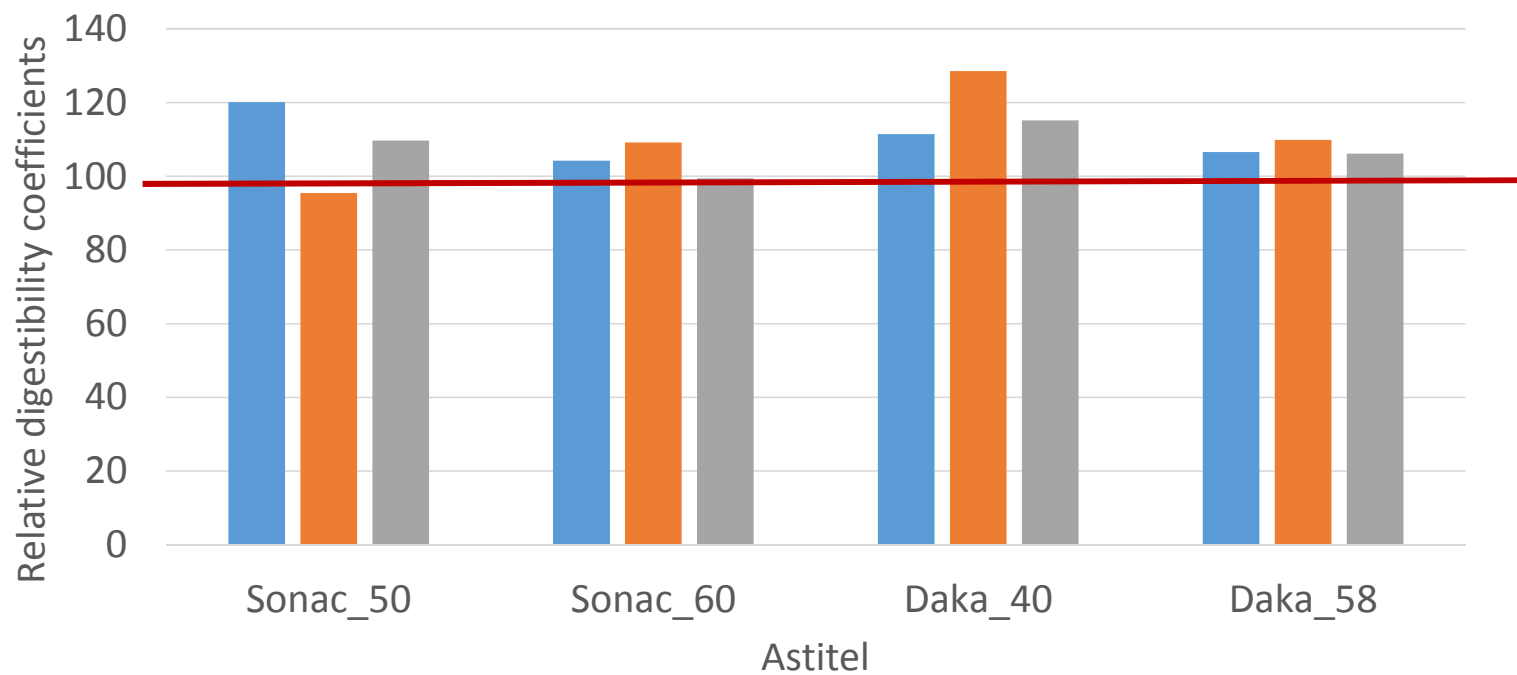
Digestibility and Metabolisable energy

| | Sonac_60 | Daka_58 | Sonac_50 | Daka_40 |
|--------------------------|----------|---------|----------|---------|
| DC_protein (%) | 83.4 | 85.3 | 90.1 | 81.4 |
| DC_fat (%) | 97.2 | 94.5 | 81.2 | 79.7 |
| AME _n (MJ/kg) | 14.33 | 14.16 | 12.54 | 9.64 |
| Dig. Lysine (g/kg) | 28.0 | 23.8 | 28.3 | 15.4 |
| Dig. Meth. (g/kg) | 7.7 | 6.6 | 7.3 | 3.7 |

Conclusion:

- Variation in digestibility; important to know origin!
- Valuable source of energy and amino acids in laying hens

Relative digestibility coefficients compared to CVB (2011)



■ DC_protein (%) ■ DC_fat (%) ■ MEn (MJ/kg)

Phosphorus digestibility of Bone meal

Determination of pre-cecal phosphorus digestibility of inorganic phosphates and bone meal products in broilers

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Source: Poultry Science (2017)

Results, pre-cecal digestibility sources

| Product | Crude protein (g/kg) | P (g/kg) | Ca (g/kg) | pcdP-% ingredient |
|----------------|----------------------|----------|-----------|---------------------|
| Delfos | 0 | 168 | 234 | 94.5 ^a |
| Calfos | 100 | 140 | 308 | 86.9 ^b |
| Bone meal | 350 | 105 | 222 | 78.2 ^c |
| MCP | 0 | 220 | 182 | 88.5 ^{a,b} |
| DCP | 0 | 190 | 275 | 82.4 ^{b,c} |
| P-value | | | | <.001 |
| LSD | | | | 6.9 |

Effect of PAPs on performance



Rapport 318

Effect van varkensvleesmeel in
vleeskuikenvoer op technische resultaten,
slachtrendementen, strooiselkwaliteit,
voetzollaesies en darmgezondheid

Effect of pork meat meal in broiler diets on
performance, slaughter yields, litter quality,
foot pad dermatitis and gut health

J. van Ham
R.J. Molenaar (GD voor Dieren - Deventer)
T. Veldkamp

April 2010

Material and Methods

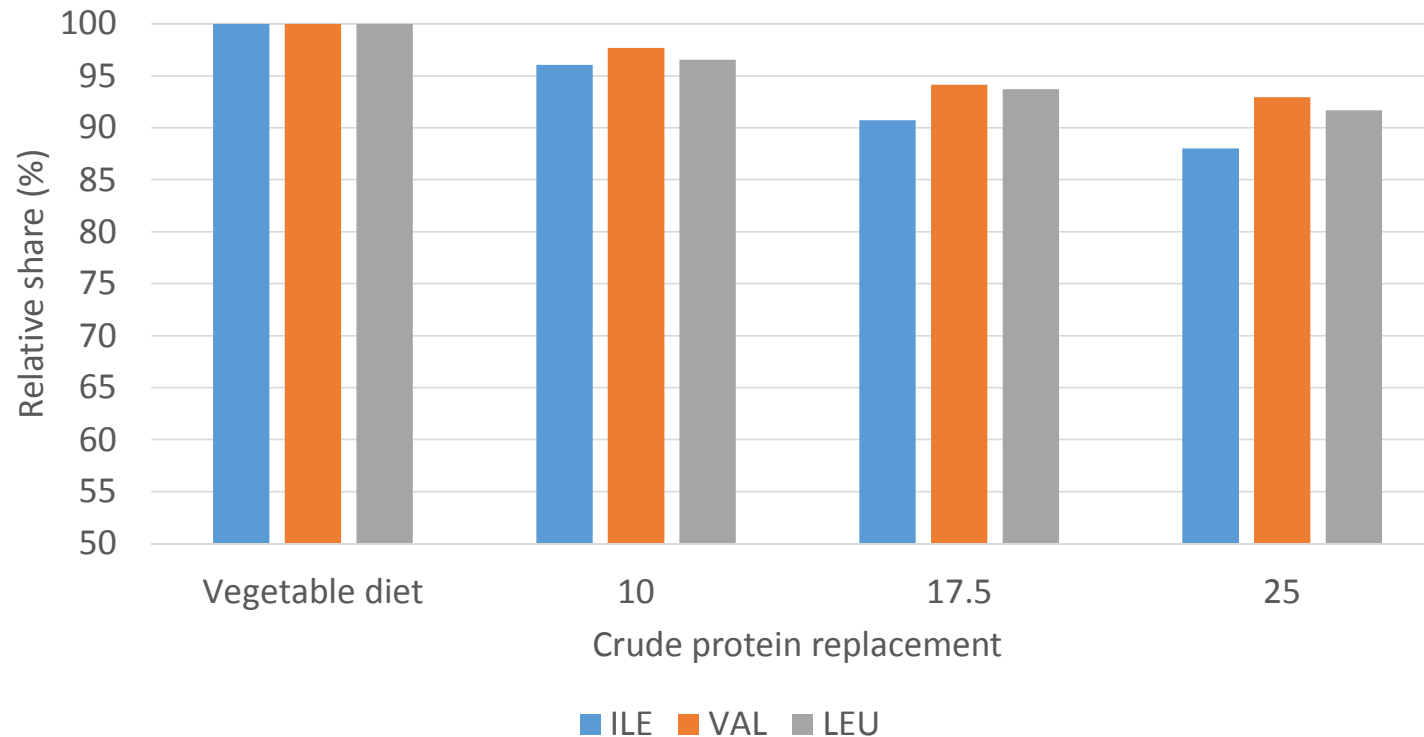
- 2 feeding phases 0 – 10 d and 11 – 35 d
- 4 dietary treatments: inclusion of Pork Meat Meal (PMM)
 - Vegetable diet
 - \approx 3.5% PMM (CP 67%) replacing 10.0% CP in basal diet
 - \approx 6.0% PMM (CP 67%) replacing 17.5% CP in basal diet
 - \approx 8.5% PMM (CP 67%) replacing 25.0% CP in basal diet
- Exchange of soybean meal and potato protein by PMM
- Diets: Iso-caloric, similar protein- en AA contents
- Observations: Performance results, Processing yields, Foot pad lesions

Performance broiler study

| Parameter | Vegetable diet | Crude Protein replacement | | |
|------------------------------|--------------------|---------------------------|--------------------|--------------------|
| | | 10 | 17.5 | 25 |
| Body weight 35 d (g) | 2303 | 2323 | 2285 | 2259 |
| Body weight gain (g) | 2260 | 2281 | 2242 | 2216 |
| Body weight gain (g/d/d) | 64.6 | 65.2 | 64.1 | 63.3 |
| Mortality (%) | 3.1 | 2.4 | 1.9 | 1.8 |
| Feed conversion ratio | 1.560 ^a | 1.567 ^a | 1.593 ^b | 1.607 ^b |
| Feed conversion ratio 2300 g | 1.559 ^a | 1.560 ^a | 1.597 ^b | 1.619 ^c |
| Feed intake (g) | 3520 | 3571 | 3566 | 3559 |

a,b,c Means within a row are significantly different ($P < 0.05$).

Relative share of non-essential amino acids (Vegetable diet = 100%)



EFPRA broiler study

- Replacement of **soybean meal** by PAP_1 and PAP_2
 - 40% in starter diet
 - 30% in grower diet
 - 20% in finisher diet

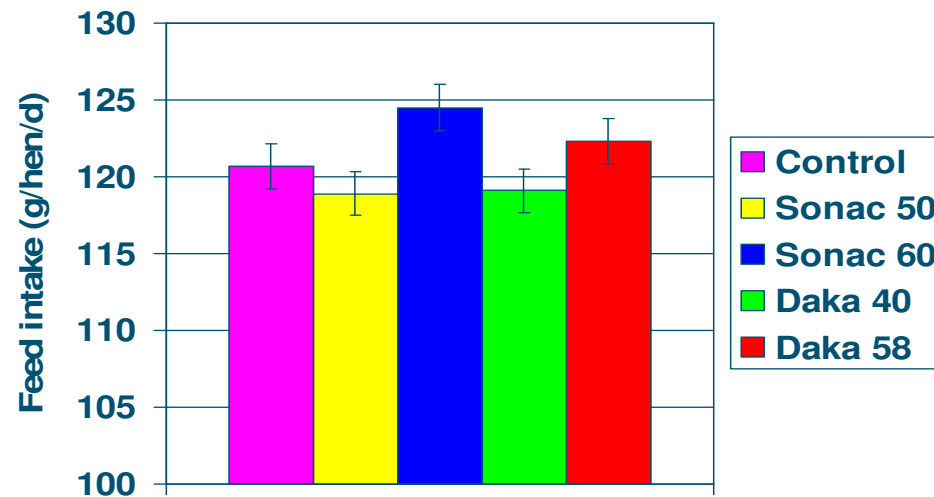
Corrected AME conversion ratio (0 – 42 d)

| | Control | PAP 1 | PAP 2 | F-prob |
|--|--------------------|--------------------|--------------------|---------------|
| Feed conversion ratio (g/g) | 1.381 ^b | 1.411 ^a | 1.406 ^a | 0.034 |
| FCR 3850g¹ | 1.389 | 1.390 | 1.413 | 0.374 |
| | | | | |
| Calculated AME diet (MJ/kg) | 12.50 | 12.50 | 12.50 | |
| Realised AME diet (MJ/kg) | 12.50 | 12.23 | 12.24 | |
| | | | | |
| Calculated AME conversion ratio | 17.26 | 17.64 | 17.58 | |
| Realised AME conversion ratio | 17.26 | 17.26 | 17.21 | |

Performance in laying hen study

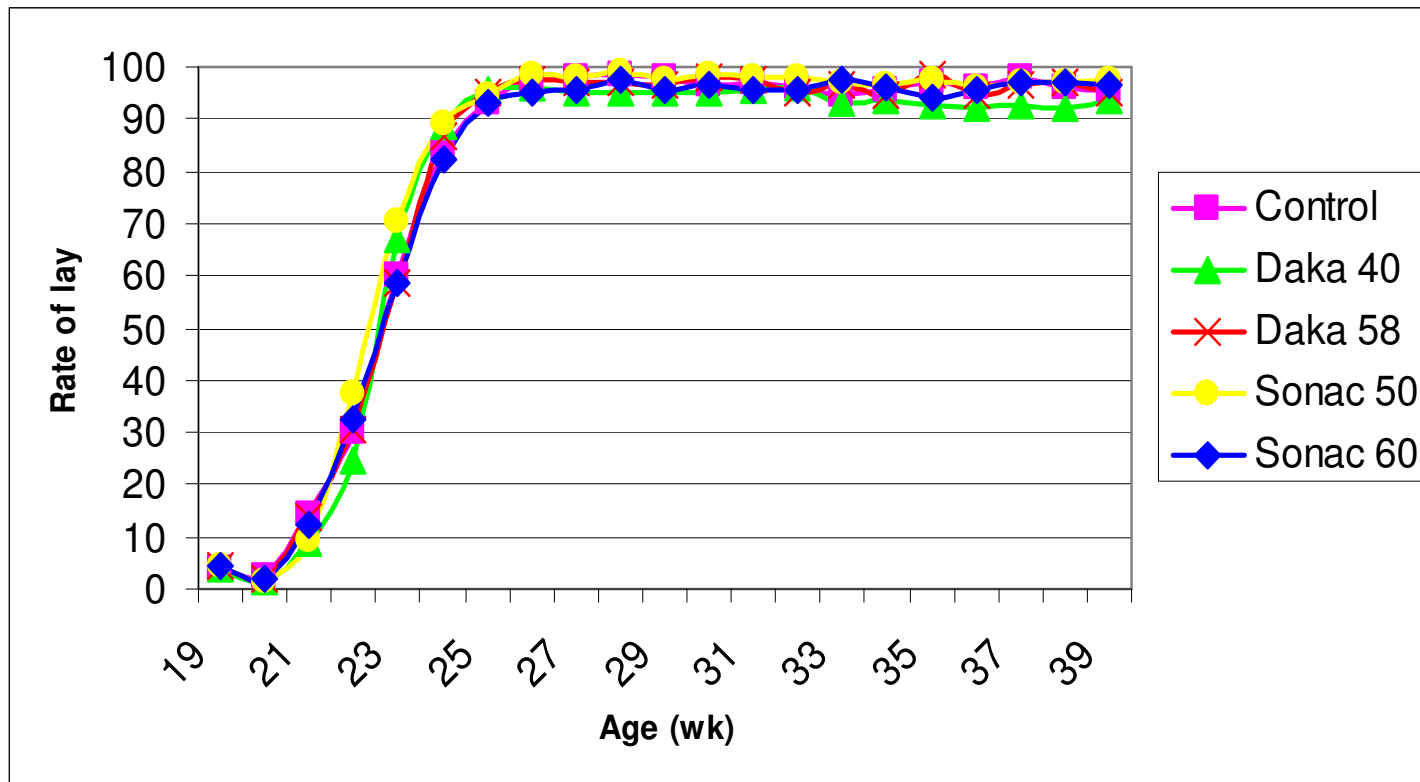


Average feed intake (g/hen/d)

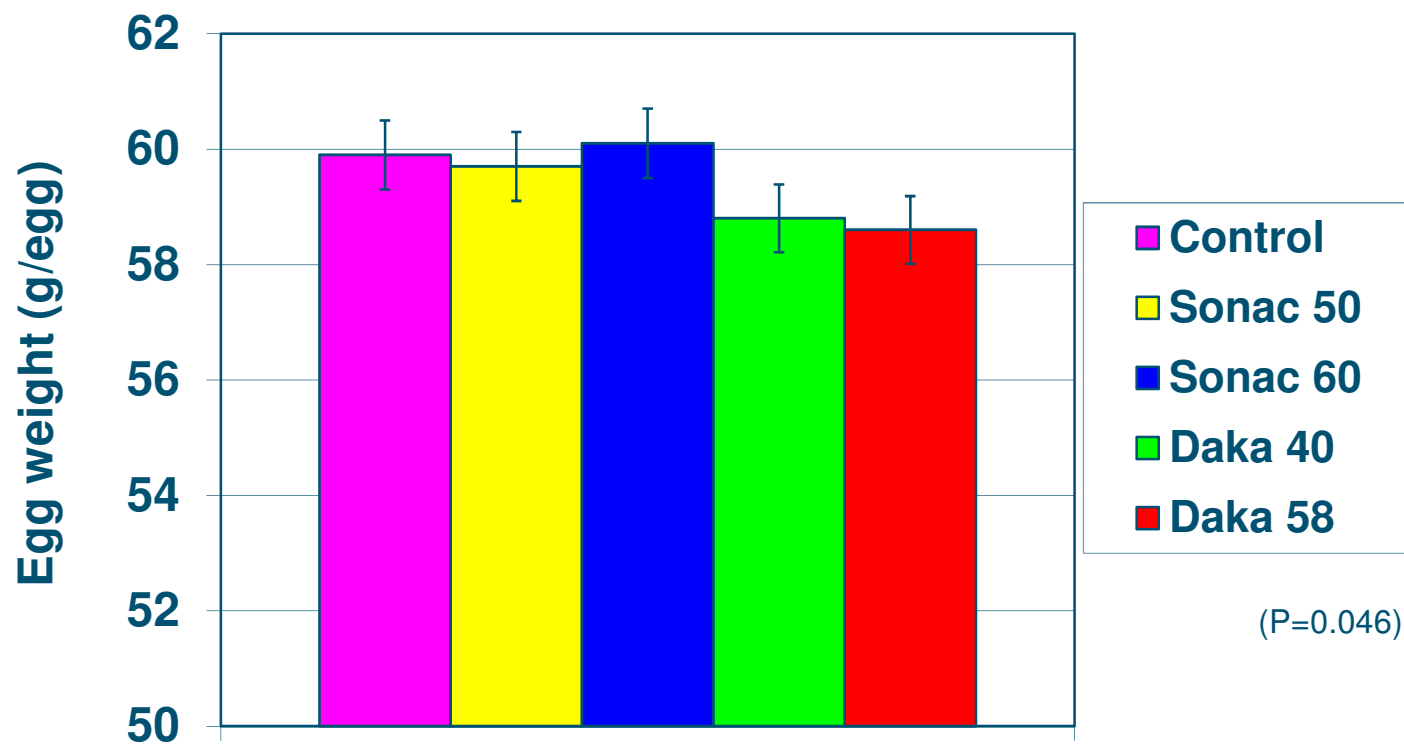


(P=0.102)

Development of rate of lay (%)



Average egg weight (g/egg)



Conclusions: Nutritional evaluation of PAPs

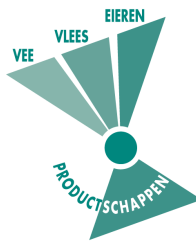
- Valuable sources of **energy, amino acids, macro minerals**
- **Intensive PAP processing** seem to affect nutrient digestibility in broilers → validation studies needed
- For maintaining broiler performance → **non-essential AA**
- CVB Table values in line with findings **in laying hens**
- PAPs-fed laying hens → **similar performance** as control diet (SBM) fed hens

- High quality, locally sourced protein source → replace **imported** soybeans

Thanks for your attention!



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 **WAGENINGEN**
UNIVERSITY & RESEARCH


100years
1918 — 2018

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