

# Nutritional evaluation of Processed Animal Proteins in poultry

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- Energy and protein/amino acid digestibility
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# Reasons for nutritional evaluation of PAPs

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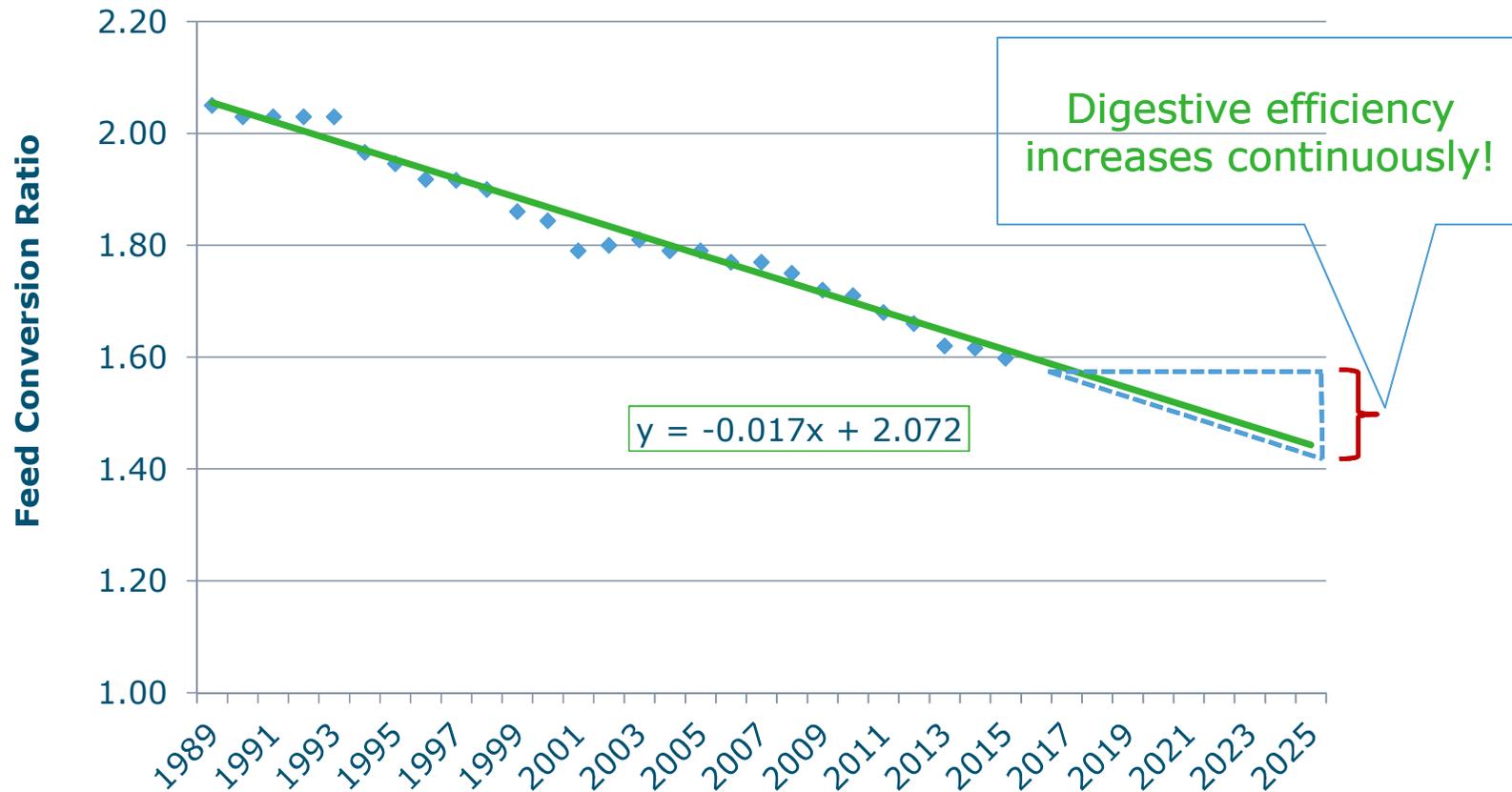
- Valuable protein, energy, and mineral source

	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

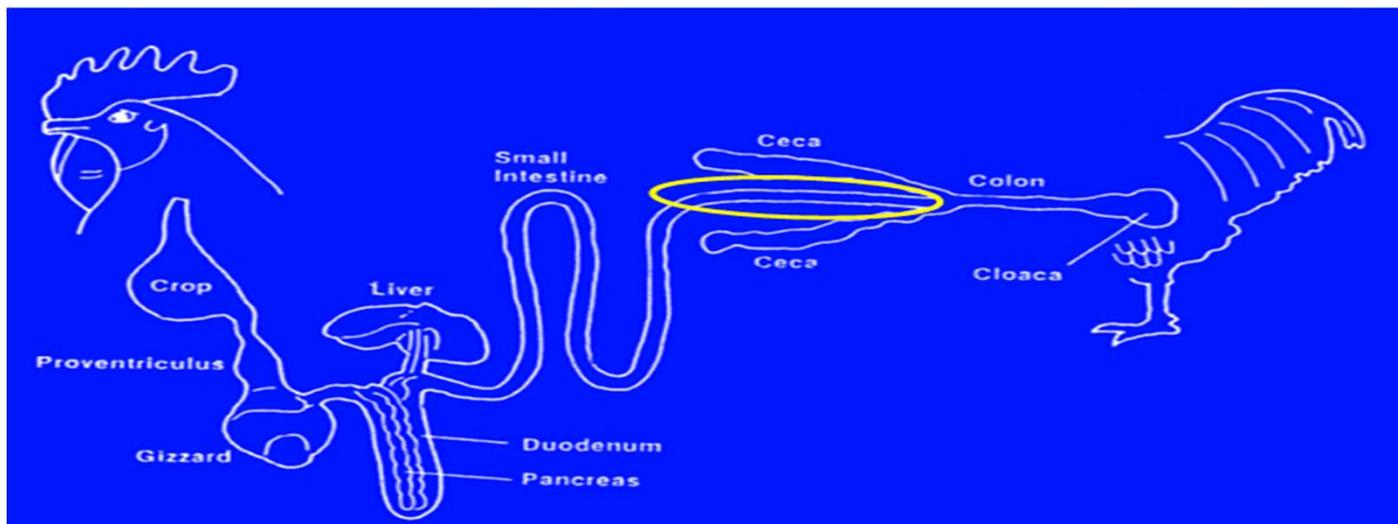
Pre-experimental period (0 -14 days)



Experimental period (14 – 23 days)

# Digestibility study

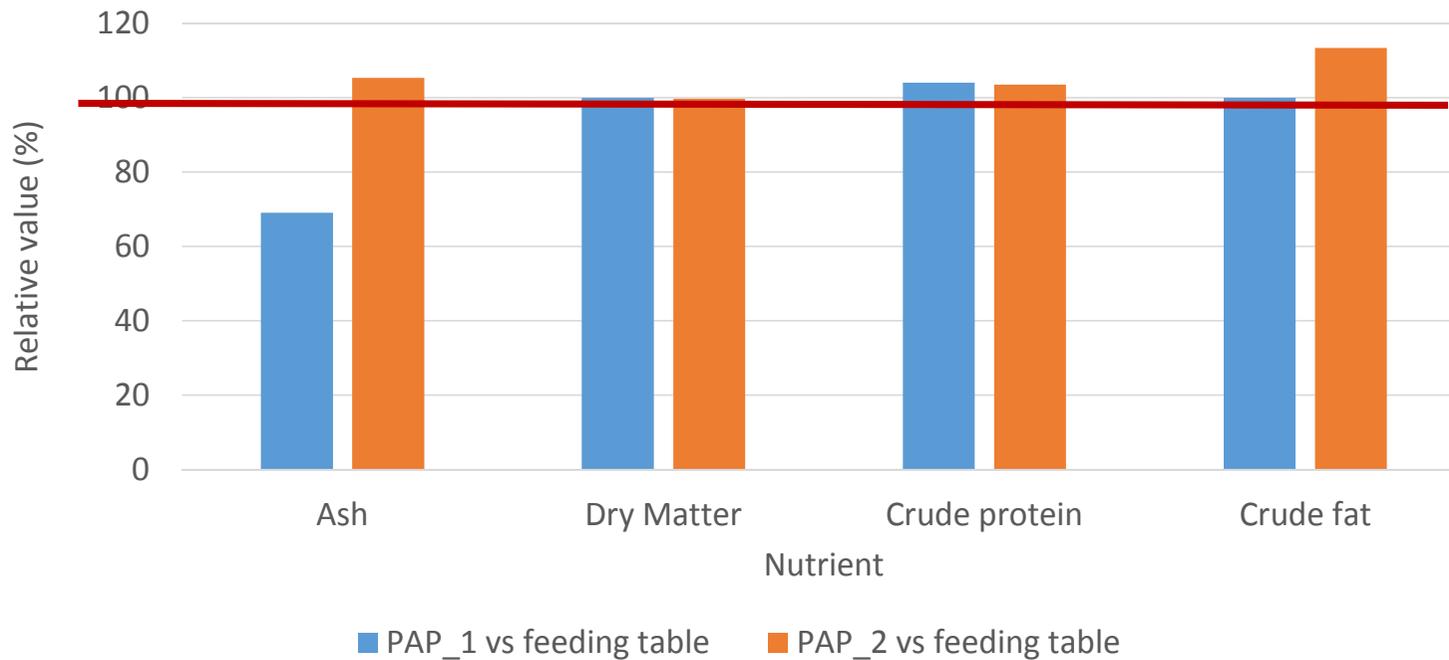
- Aim: to determine in PAP\_1 and PAP\_2 broiler diets:
  - total tract digestibility of proximate components
  - ileal phosphorus, calcium, amino acid digestibility
  - AME (metabolizable energy value)



## 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)



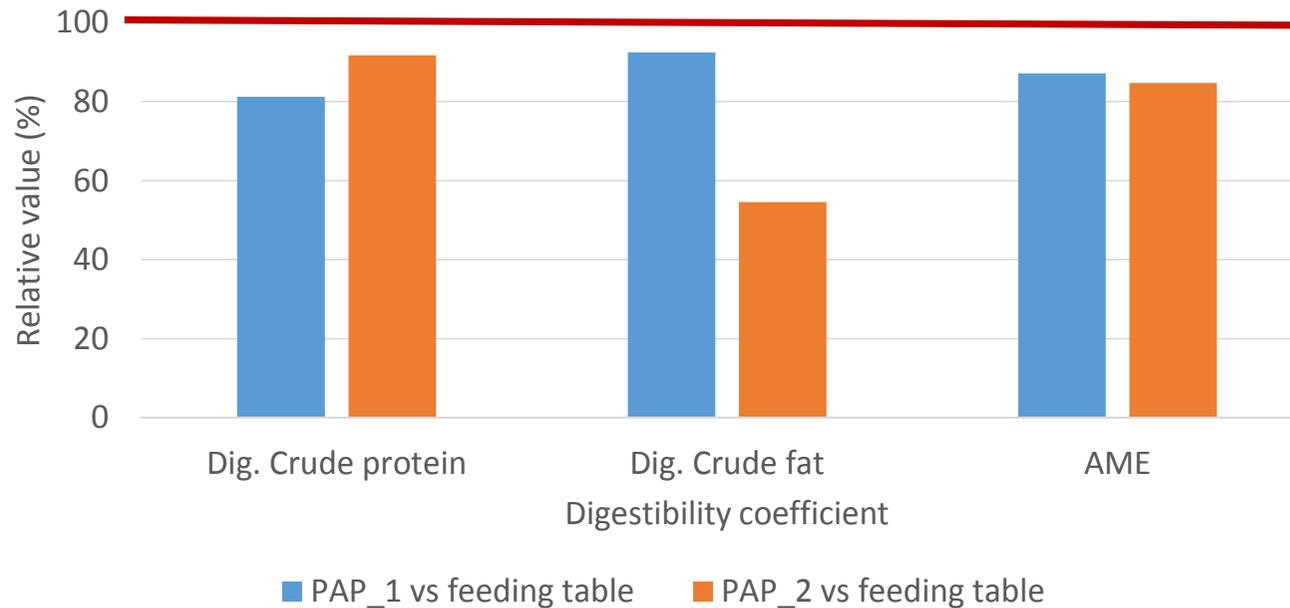
- PAP\_1: Low in ash
- PAP\_2: High in crude fat

# Nutrient digestibility tested PAP's

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

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## 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

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- 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

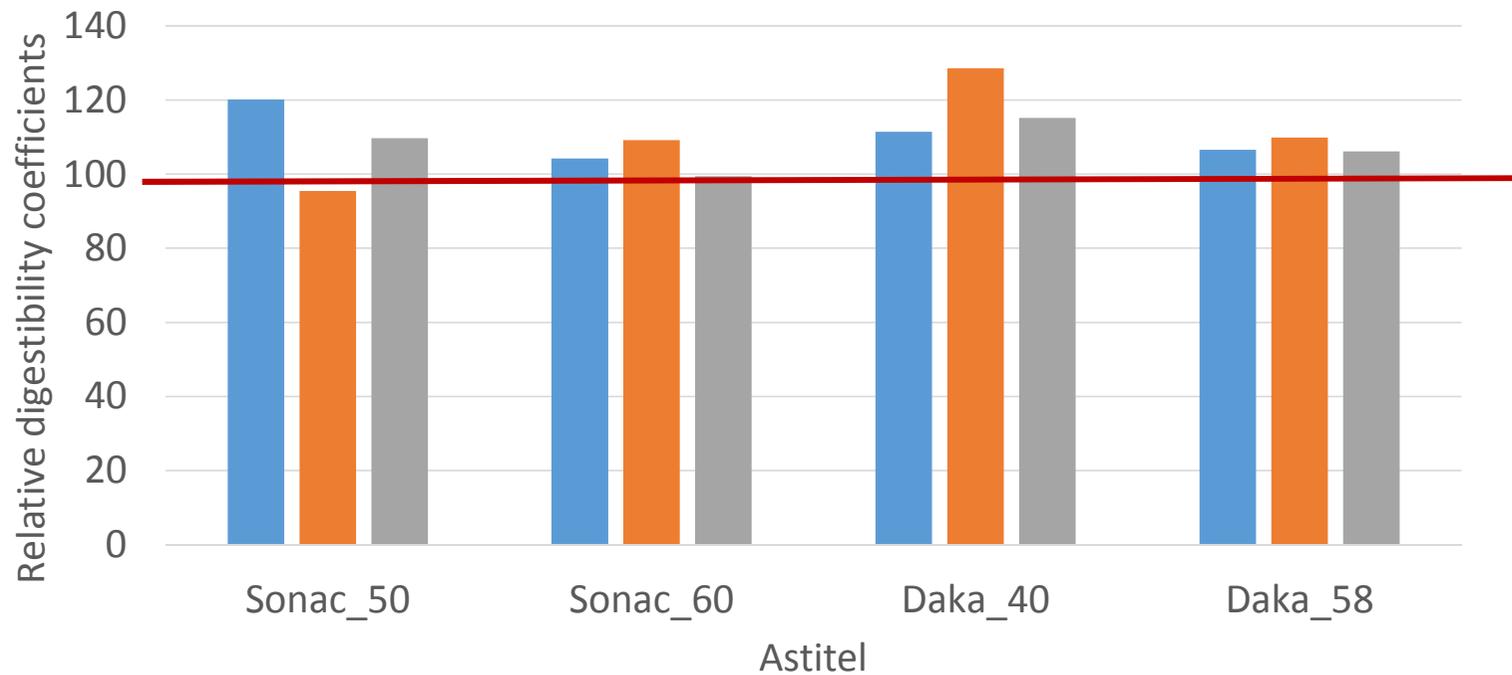
# Digestibility and Metabolisable energy

	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 <sub>n</sub> (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)

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# Phosphorus digestibility of Bone meal

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## 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 <sup>a</sup>
Calfos	100	140	308	86.9 <sup>b</sup>
Bone meal	350	105	222	78.2 <sup>c</sup>
MCP	0	220	182	88.5 <sup>a,b</sup>
DCP	0	190	275	82.4 <sup>b,c</sup>
<b>P-value</b>				<.001
<b>LSD</b>				6.9

# Effect of PAPs on performance

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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

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

April 2010

# Material and Methods

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- 2 feeding phases 0 – 10 d and 11 – 35 d
- 4 dietary treatments: inclusion of Pork Meat Meal (PMM)
  - Vegetable diet
  - ≈ 3.5% PMM (CP 67%) replacing 10.0% CP in basal diet
  - ≈ 6.0% PMM (CP 67%) replacing 17.5% CP in basal diet
  - ≈ 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 <sup>a</sup>	1.567 <sup>a</sup>	1.593 <sup>b</sup>	1.607 <sup>b</sup>
Feed conversion ratio 2300 g	1.559 <sup>a</sup>	1.560 <sup>a</sup>	1.597 <sup>b</sup>	1.619 <sup>c</sup>
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

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- 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)

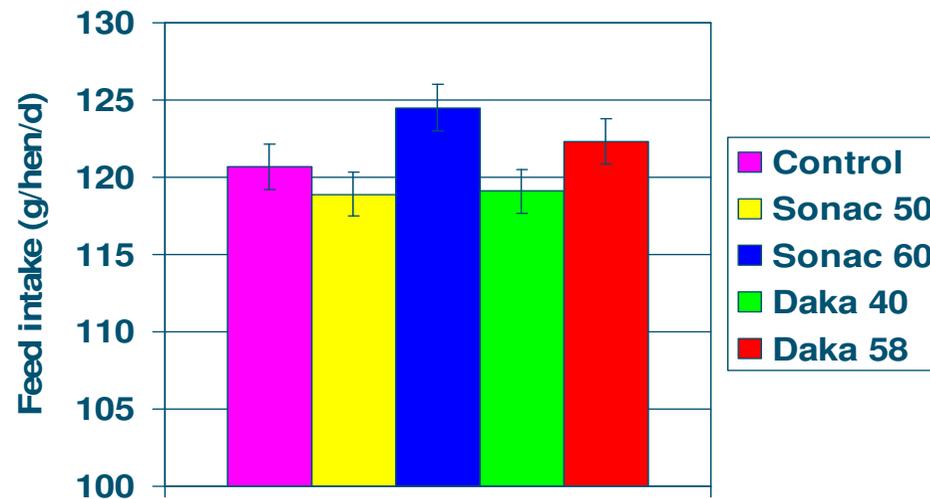
	<b>Control</b>	<b>PAP 1</b>	<b>PAP 2</b>	<b>F-prob</b>
<b>Feed conversion ratio (g/g)</b>	1.381 <sup>b</sup>	1.411 <sup>a</sup>	1.406 <sup>a</sup>	0.034
<b>FCR 3850g<sup>1</sup></b>	1.389	1.390	1.413	0.374
<b>Calculated AME diet (MJ/kg)</b>	12.50	12.50	12.50	
<b>Realised AME diet (MJ/kg)</b>	12.50	12.23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

# Performance in laying hen study

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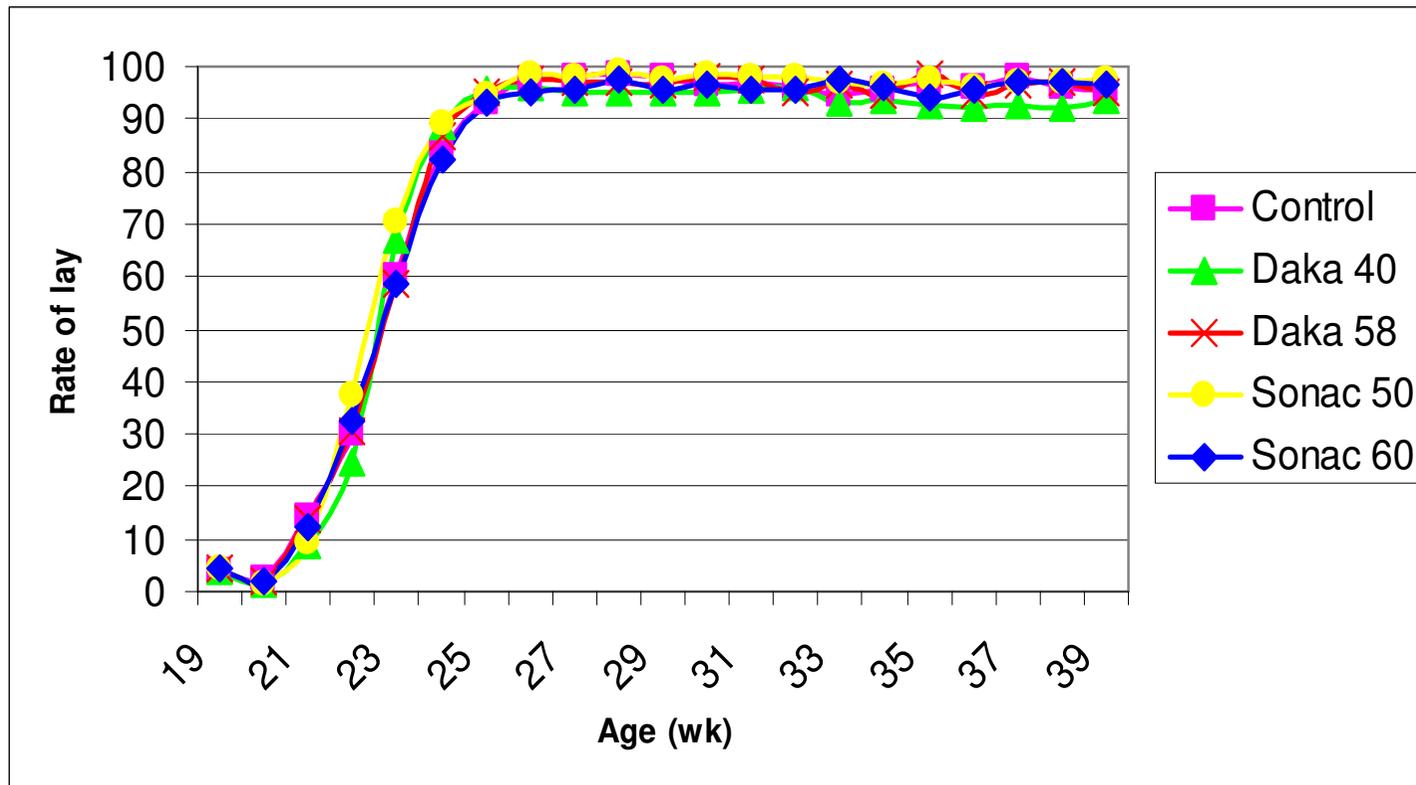


## Average feed intake (g/hen/d)

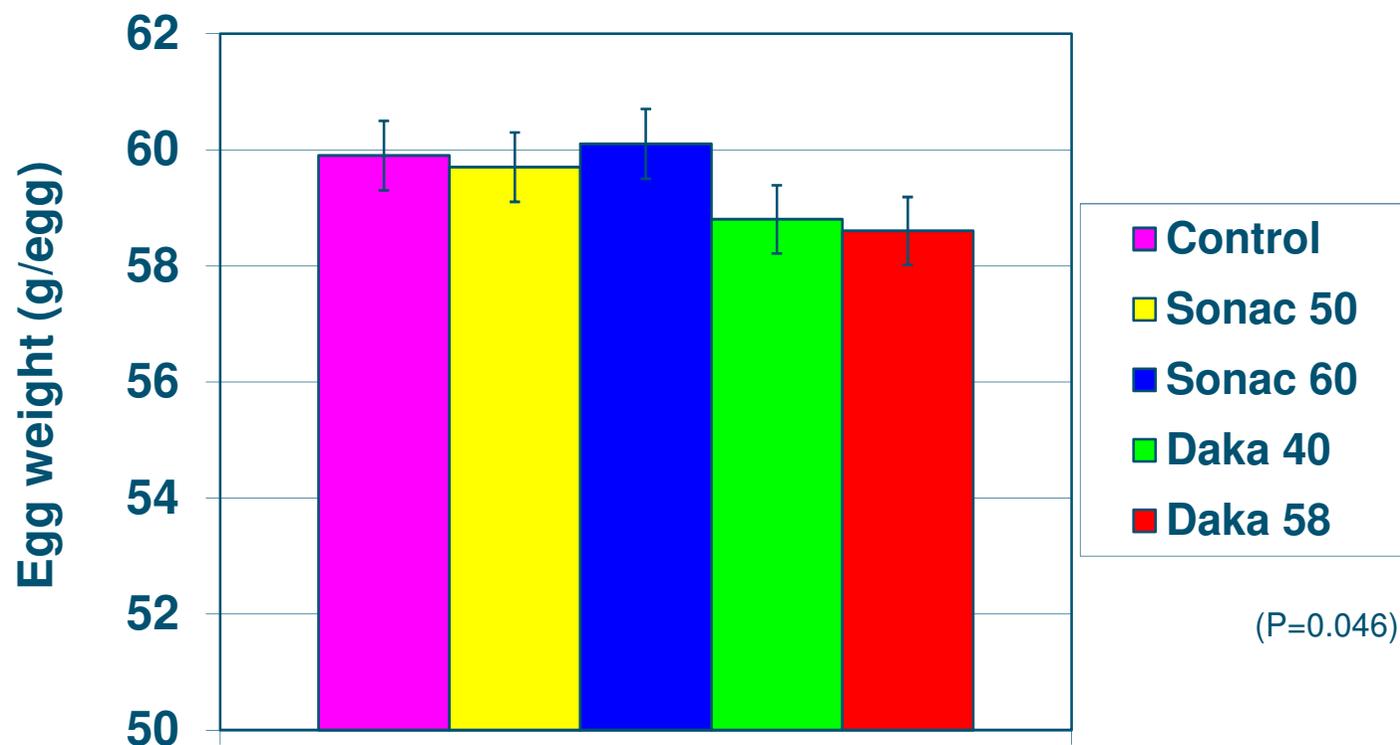


(P=0.102)

# Development of rate of lay (%)



## Average egg weight (g/egg)



# Conclusions: Nutritional evaluation of PAPs

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- 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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