

**62nd Annual Meeting EAAP 2011
August 31st – September 2nd, Stavanger, Norway
Session 40. Animal nutrition**

**Effect of a multiple enzyme composition on the
performance and nutrient digestibility in broilers**

Filip Nuyens, Tone Stigen Martinsen, Natalia Soares

KEMIN AgriFoods EMEA

Toekomstlaan 42, 2200 Herentals, Belgium



Role of feed enzymes

Multiple enzymes for multiple substrates in feed

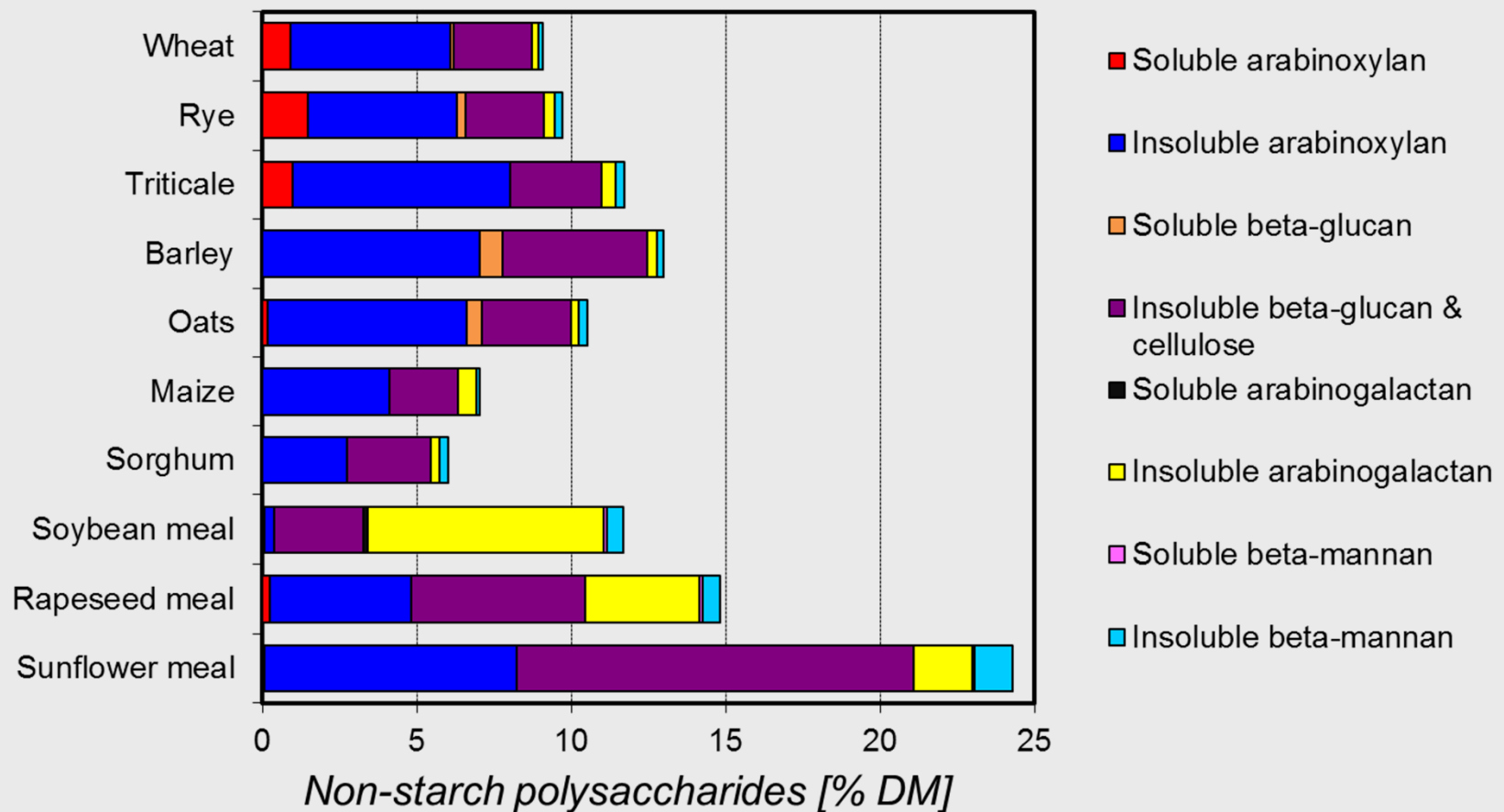
Substrate	Enzyme
Starch	Alpha-amylase
Protein	Protease
Non-starch polysaccharides - Soluble NSP - Insoluble NSP	Different types of NSPases
Phytate	Phytase



Role of feed enzymes

Non-starch polysaccharides in feed raw materials

Measured by Kemin based on the method of Englyst *et al.* (1992)



Role of feed enzymes

Degradation of polysaccharides from finished feed

In vitro release of reducing sugars (40°C, pH 5, 1h)



In vivo efficacy of enzymes

Trial protocol

- Department of Animal Nutrition and Feed Management
Poznan University of Life Sciences, Poland
- July-August 2010
- Male Ross 308 broilers in floor pens
 - 8 birds per pen
 - 10 pens per treatment (n=10)
 - 5 dietary treatments
- 42 days with a 3-phase feeding program
 - starter: 0-14 days
 - grower: 14-35 days
 - finisher: 35-42 days
- High and low density diets fed as mash feed



In vivo efficacy of enzymes

Dietary treatments

Treatment	Basal diet	Enzyme inclusion
T1	High density	No enzyme
T2	High density	KEMZYME [®] Plus Dry 250 g/t
T3	High density	KEMZYME [®] Plus Dry 500 g/t
T4	Low density	No enzyme
T5	Low density	KEMZYME [®] Plus Dry 500 g/t



In vivo efficacy of enzymes

Diet formulation

High density diet (T1 grower)

versus

Low density diet (T4 grower)

AME - 134 kcal/kg

Met - 0.20 g/kg

Lys - 0.41 g/kg

➔ *AME, Met and Lys reduced with ~4% of requirement*

		T1-T3			T4-T5		
		Starter	Grower	Finisher	Starter	Grower	Finisher
Wheat	%	40	40	40	40	40	40
Soybean meal 44%	%	37	35.72	29.7	37	35.72	29.7
Maize	%	12.59	12.85	20	15.17	15.43	22.29
Soybean Oil	%	3.05	3.75	3.5	1.8	2.5	2.4
Animal fat	%	3.05	3.75	3.5	1.8	2.5	2.4
Lysine	%	0.3	0.2	0.18	0.24	0.14	0.1
Methionine	%	0.16	0.13	0.1	0.14	0.11	0.09
Limestone	%	0.8	0.55	0.47	0.8	0.55	0.47
Monocalcium phosphate	%	1.6	1.3	1.1	1.6	1.3	1.1
NaHCO ₂	%	0.1	0.1	0.1	0.1	0.1	0.1
Salt	%	0.35	0.35	0.35	0.35	0.35	0.35
TiO ₂	%	0	0.3	0	0	0.3	0
Vit. and mineral premix	%	1	1	1	1	1	1
Calculated nutritional value							
Dry matter	%	86.7	86.9	87.2	86.9	86.7	86.7
Crude protein	%	22.01	21.49	19.52	22.29	21.75	19.73
Crude fibre	%	2.9	2.86	2.87	2.97	2.93	2.89
Crude fat	%	7.91	9.27	8.95	5.61	6.95	6.9
Ash	%	6.4	5.86	5.38	6.45	5.87	5.42
Starch	%	33.85	34.1	37.98	35.7	35.6	39.5
Ca	%	1.065	0.9	0.813	1.066	0.901	0.814
Pav	%	0.53	0.459	0.409	0.53	0.46	0.41
Na	%	0.186	0.186	0.185	0.187	0.186	0.185
Total methionine	%	0.499	0.46	0.409	0.485	0.44	0.404
Total Lysine	%	1.4	1.291	1.135	1.36	1.25	1.08
Metabolisable energy	MJ/kg	12.59	13.01	13.26	12.1	12.45	12.77



In vivo efficacy of enzymes

Digestibility results

Nutrient digestibilities (%)

Nutrient	High density T1 No enzyme	High density T2 Enzyme 250 g/t	High density T3 Enzyme 500 g/t	Low density T4 No enzyme	Low density T5 Enzyme 500 g/t
Dry matter	63	64	65	64	64
NDF	15 b	16 b	24 a	17 b	22 a
Crude fat	52 b	62 a	65 a	52 b	63 a
Nitrogen	44	45	47	43	46

* Values within the same row that are significantly different ($P < 0.05$) are indicated by different indices.



In vivo efficacy of enzymes

Digestibility results

Apparent Metabolisable Energy (AMEn, kcal/kg)

	High density T1 No enzyme	High density T2 Enzyme 250 g/t	High density T3 Enzyme 500 g/t	Low density T4 No enzyme	Low density T5 Enzyme 500 g/t
AMEn	2806 cd	2905 ab	2943 a	2726 d	2831 bc
Δ AMEn	--	99	137	--	105

* Values within the same row that are significantly different ($P < 0.05$) are indicated by different indices.



Conclusions

- The substrate for feed enzymes in a finished feed is very complex, in particular the **NSP** fraction
- Although the use of **NSP-degrading enzymes** is most common for wheat based diets, also diets based on maize or combined wheat and maize benefit from enzyme supplementation.
- Both **fat and fiber digestibility** was improved by enzyme treatment
- Multiple enzyme supplementation upgraded the energy level of a low density diet to that of a high density diet (reformulation)
- Both on top application of enzyme and a reformulation approach are feasible, resulting in **AMEn gain** of a least 100 kcal/kg feed.



Thank you.

