

**BASF Nutrition –  
the healthy decision**

# **Natugrain® TS - New and highly effective NSP-dehydrolyzing enzyme from BASF**

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19-21 October 2010, Novi Sad, Serbia

 **BASF**  
The Chemical Company

- **Impact of NonStarchPolysaccharides (NSP) in animal nutrition**
- **Product characteristics**
- **Storage and processing properties**
- **EU Approval and dosage recommendations**
- **Product performance in animal feeding**
- **Conclusions**

## Content of pentosans and $\beta$ -glucans in cereals (g/kg)



Cereal	Pentosans		$\beta$ -Glucans	
	total	soluble	total	soluble
corn	40–70	5	1–2	–
wheat	50–80	11	5–9	–
rye	60–120	23	10–50	–
oats	40–80	8	20–50	16
barley	30–80	8	20–70	37

Jeroch, 1994 (modified)

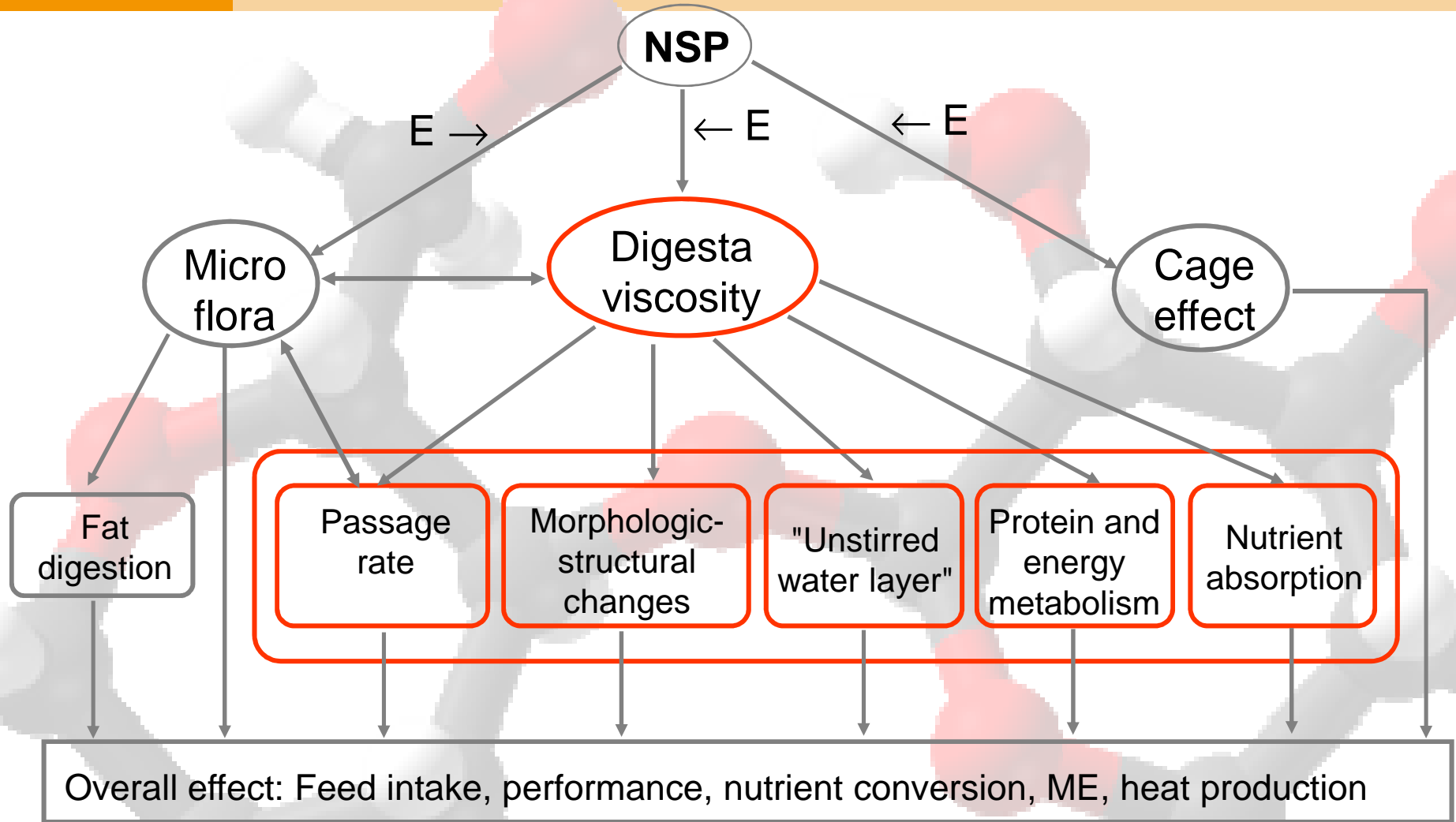


## NSP content in feed cereals dependent on / influenced by:



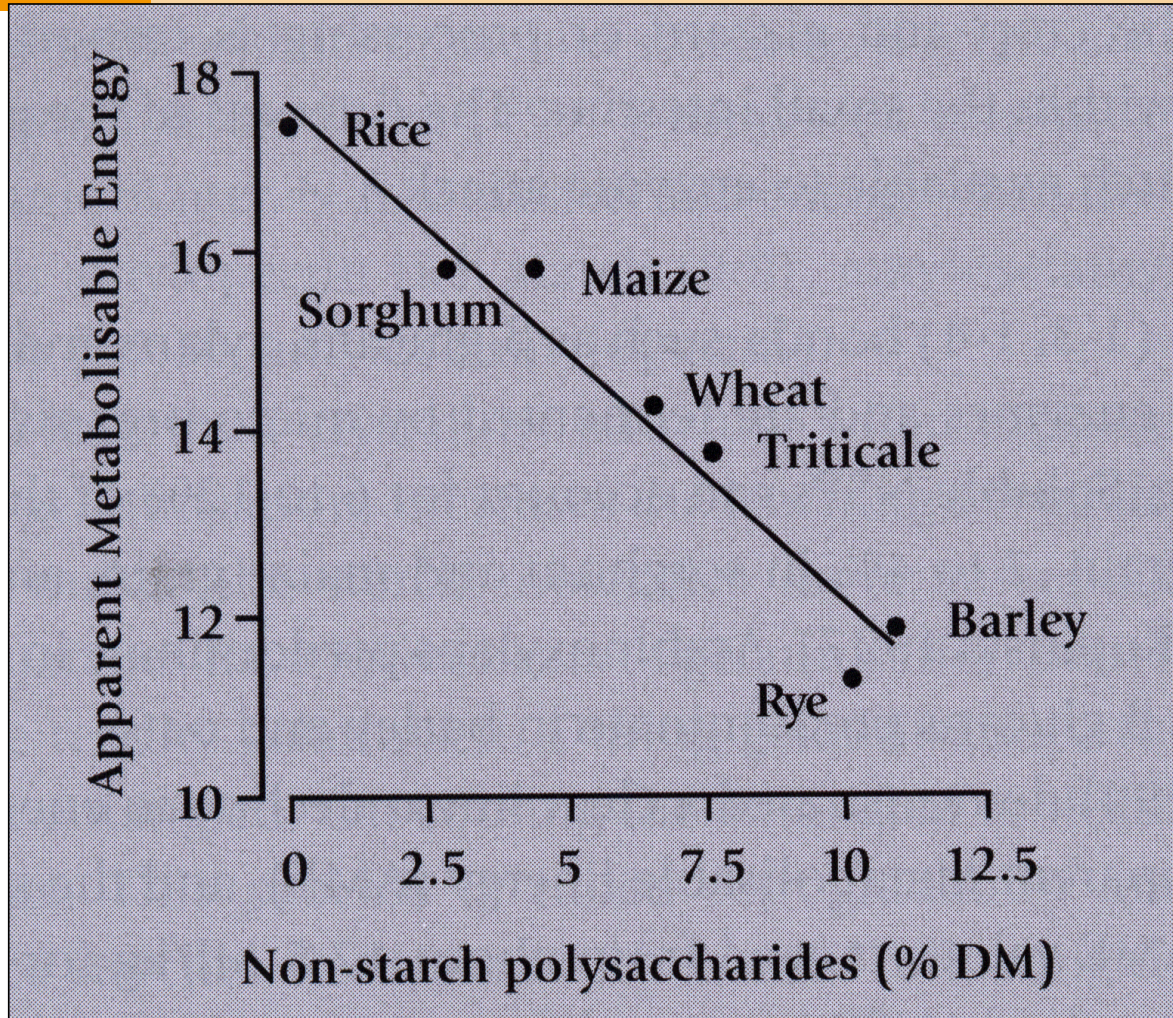
- **cultivar and type of the cereal**
- **climate during main growth and ripening phase  
(e.g. low temperature, wind, rain ⇒ NSP content ↑)**
- **storage time after harvest  
(*fresh cereals >> stored cereals*)**
- **thermal processing in feed production  
(*non-soluble NSPs partly transferred to soluble NSPs*)**

# Mode of action of Non-Starch-Polysaccharides and NSP-dehydrolysing Enzymes





# Correlation between contents of NSP & AME value of cereals for broiler chicks



(Choct & Annison, 1990)

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# Natugrain TS

## the flexible NSP-enzyme



**Natugrain TS**  
powder formulation

**Natugrain TS L**  
liquid formulation

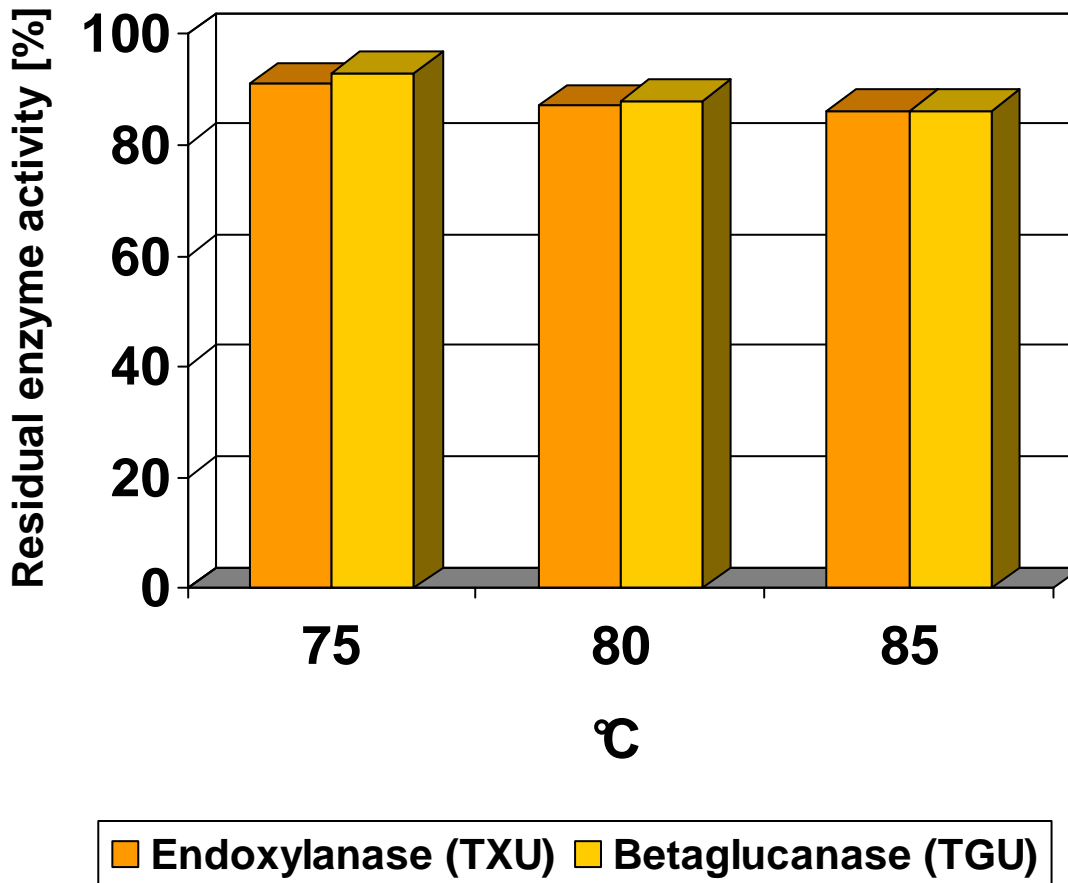
Enzyme activities:

**endo-1,4- $\beta$ -xylanase, min. 5600 TXU (Thermostable Xylanase Unit) /g**  
**endo-1,4- $\beta$ -glucanase, min. 2500 TGU (Thermostable Glucanase Unit) /g**

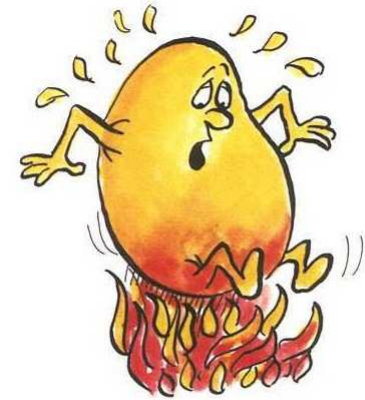


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# Pelleting stability at 3 different temperatures



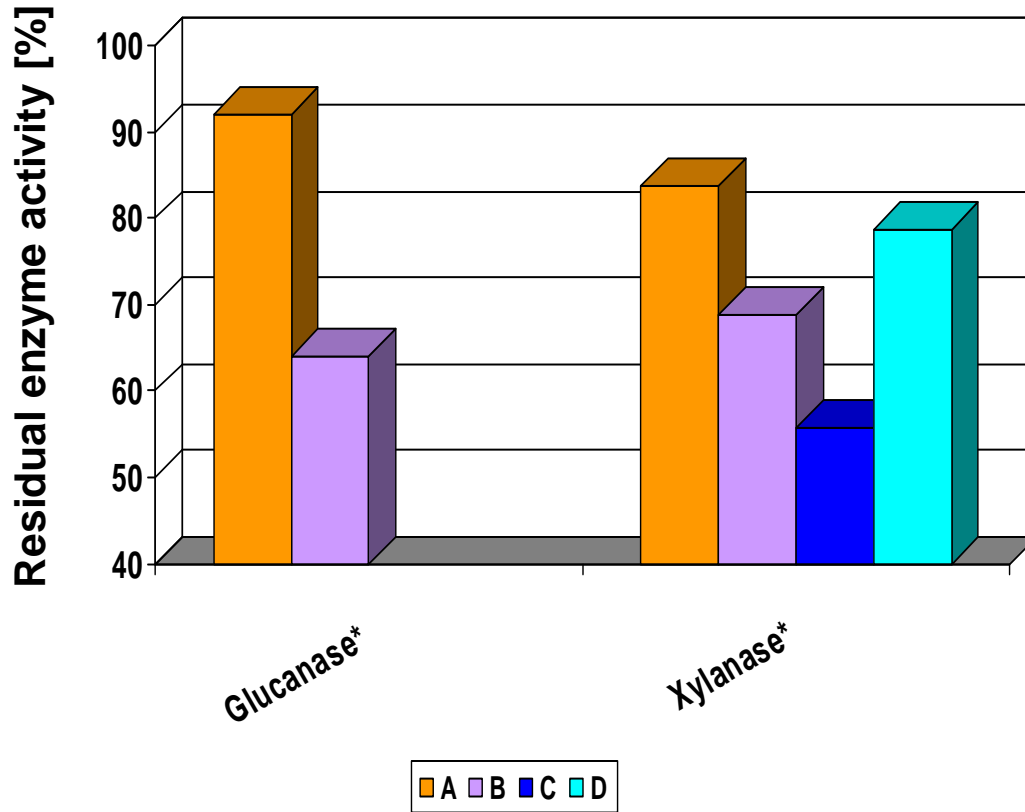
- excellent pelleting stability up to 85°C\*



\*conditioning time used in the trial: 20 s

# Pelleting stability

Comparison with competitor products  
Pelleting temperature 85 °C



**Natugrain TS** (Product A)

- best pelleting stability at 85°C compared to competitors

Competitor Products B, C and D tested at recommended dosages



LiHo-04-08

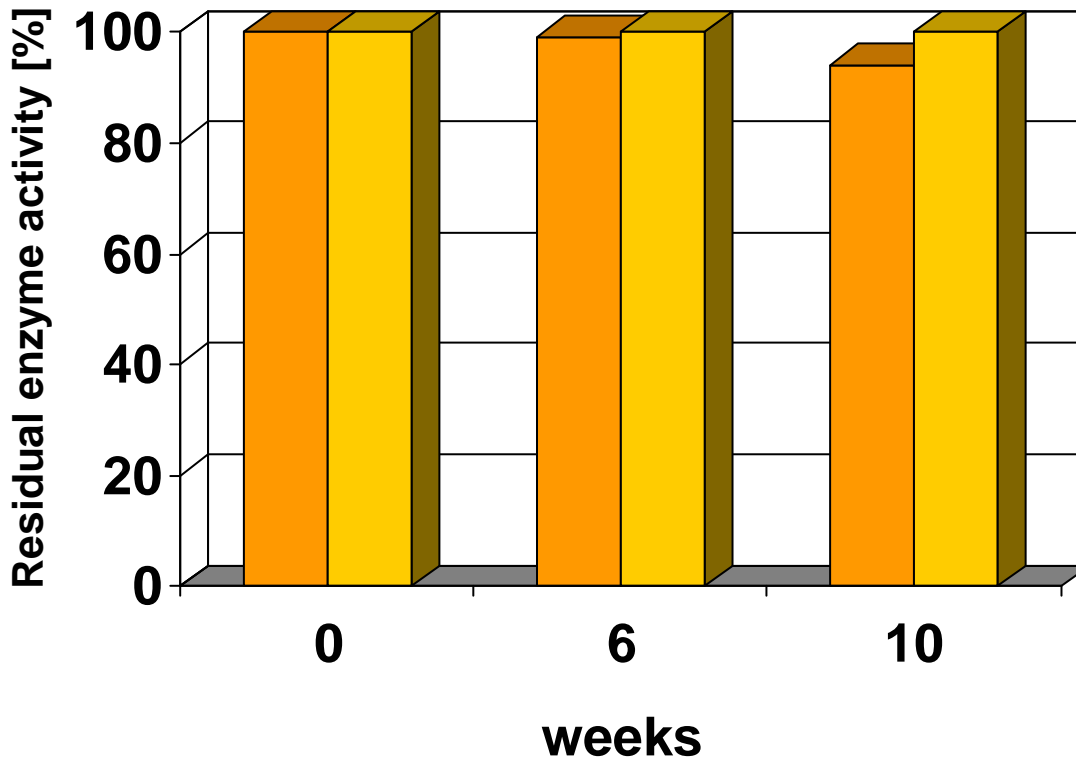
\*analysed with BASF method for TGU and TXU

# Stability in pelleted feed

Stored at 35°C



## Natugrain TS



Endoxylanase (TXU) Betaglucanase (TGU)

- excellent stability in pellets stored at high temperature



BASF 2007

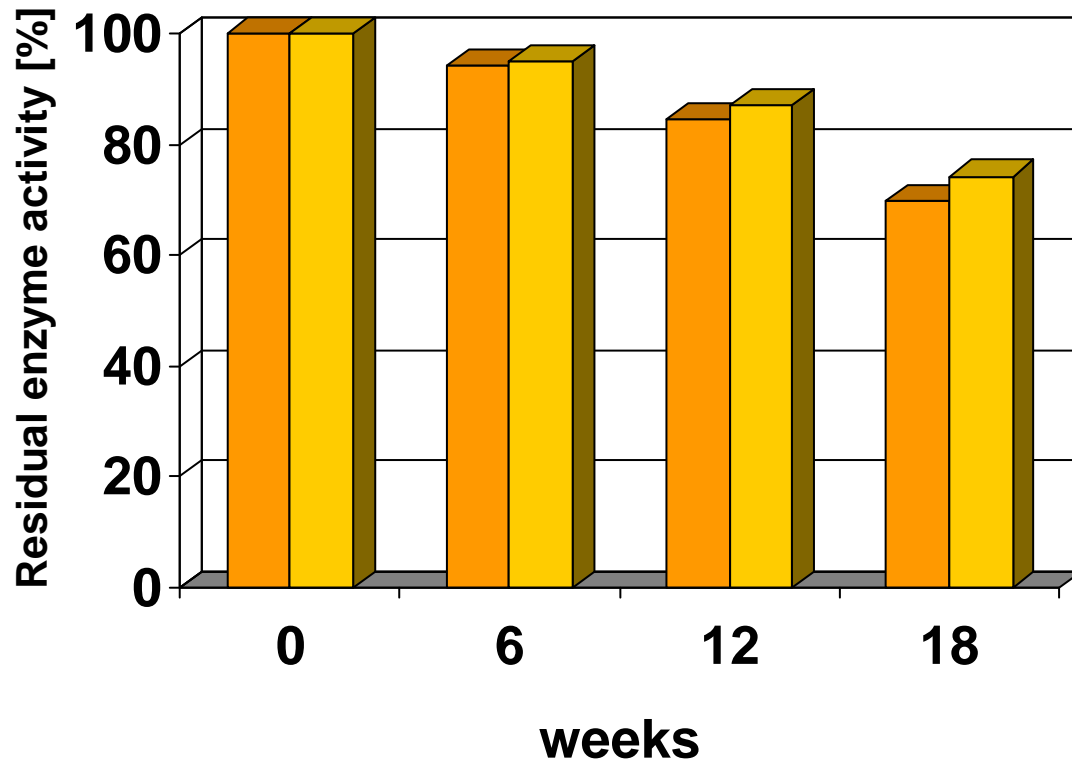


# Stability in premix

Stored at 35°C



## Natugrain TS



■ Endoxylanase (TXU) ■ Betaglucanase (TGU)

- excellent stability in premix stored at high temperature

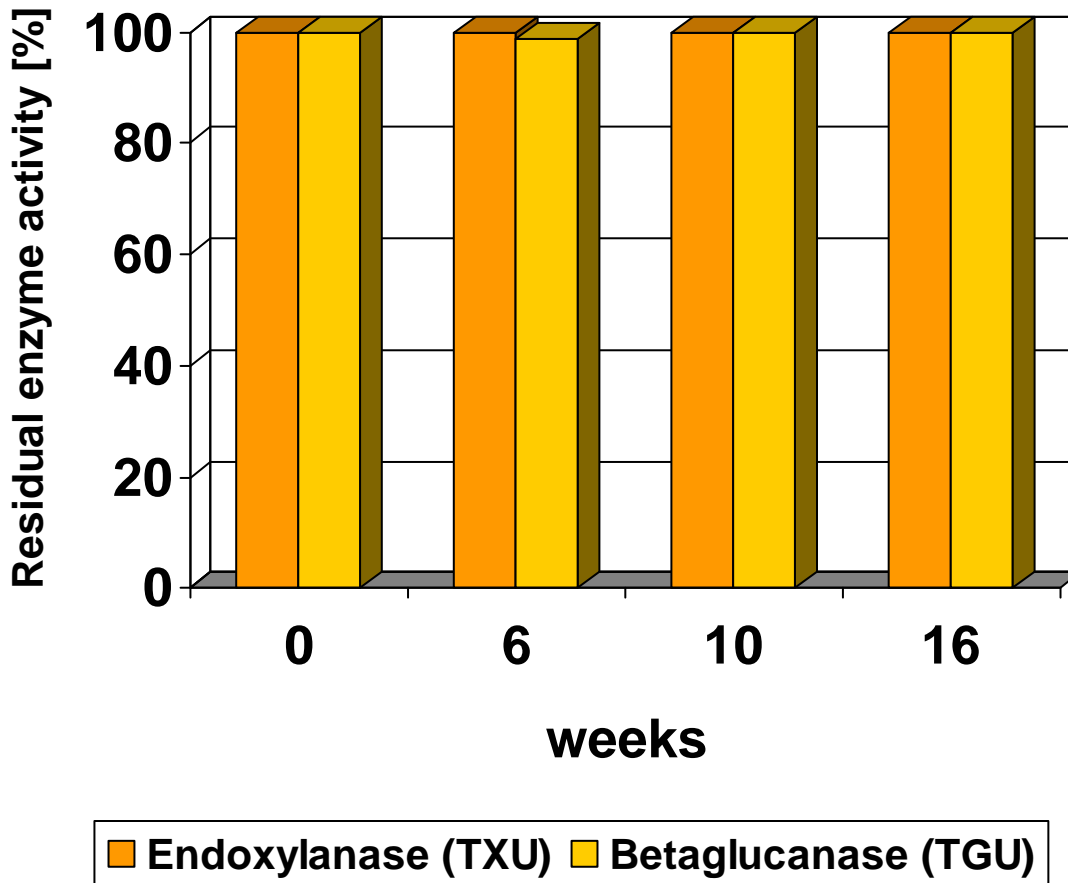


# Shelflife on pellets after PPLA

Stored at 35°C



## Natugrain TS L (liquid)



- excellent stability on pellets stored at high temperature



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# EU Approval of Natugrain TS and recommended dose rates



**approved min. dose rate**

**recommended dose rate**

- Broiler
- Duck

**50 g/t**  
**50 g/t**



Wheat, barley and/or rye	up to 40 %	<b>50 g/t</b>
	40 – 50 %	<b>75 g/t</b>
	over 50 %	<b>100 g/t</b>

- Laying hen
- Turkey
- Piglets (weaned)

**100 g/t**  
**100 g/t**  
**100 g/t**

**100 g/t**  
**100 g/t**  
**100 g/t**

- Fattening pigs **100 g/t** (expected Q3 2011)



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## Improvements in piglet performance

Trial period: 0- 42 days after weaning

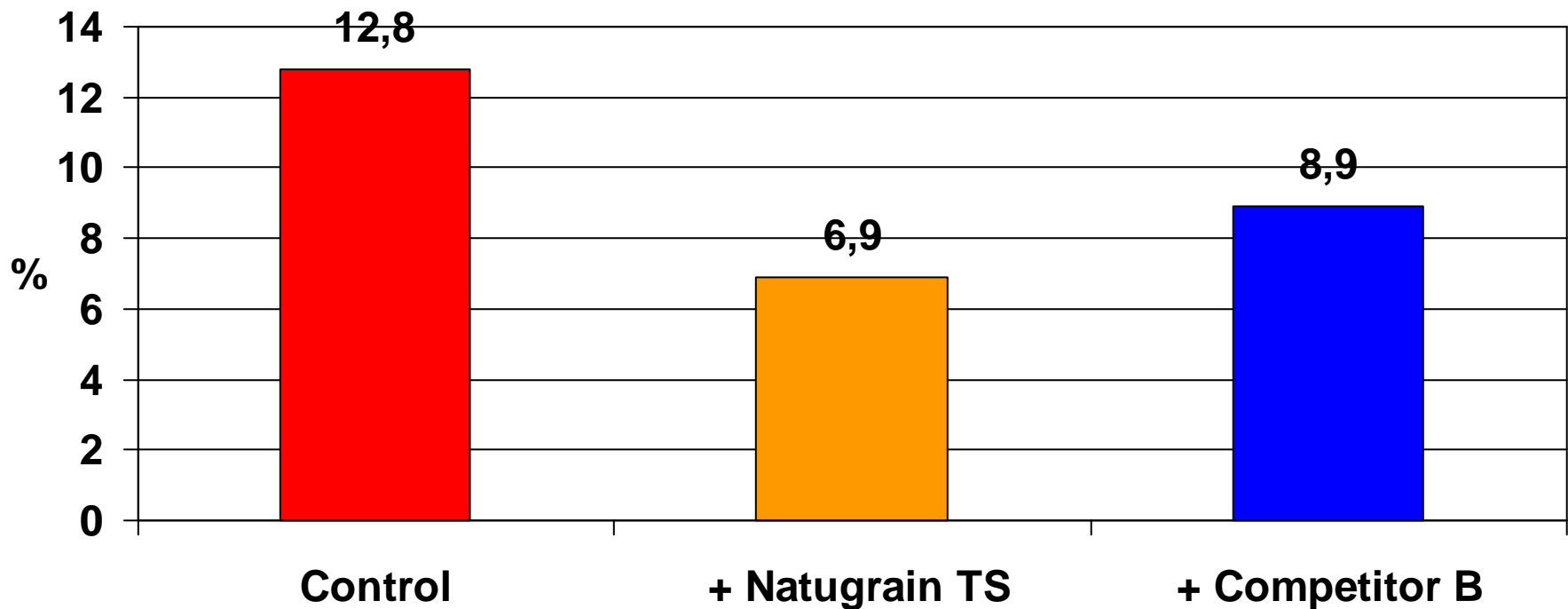


Trial	Parameter	Control	Natugrain	% improvement
Italy, 2006	DWG (g)	335	384	14.6
	FCR (g/g)	1.58	1.44	8.8
Hungary, 2007a	DWG (g)	447	474	6.0
	FCR (g/g)	1.97	1.88	4.6
Hungary, 2007b	DWG (g)	475	498	4.8
	FCR (g/g)	1.8	1.76	2.2

# Influence of NSP enzymes on feces quality in weaned piglets fed wheat and barley based diets



**% days of the experimental period with soft / aqueous feces in the piglet trial**



Source: BNA, 2009

# Laying performance from week 26 to 78

(Natugrain TS 100 g/t; 50% wheat, 10% rye)



	Control			Natugrain TS		
	26 – 52 week	52 – 78 week	Overall 26 – 78 week	26 – 52 week	52 – 78 week	Overall 26 – 78 week
Laying rate, %	93.6	87,0	<b>90.4</b>	93.2	87.2	<b>90.3</b>
Daily egg mass, g	57.6	57,0	<b>57.3</b>	57.4	57.3	<b>57.4</b>
Egg weight, g	61.5	65.5	<b>63.4</b>	61.6	65.7	<b>63.6</b>
Daily feed intake, g	119.2 <sup>a</sup>	125.9 <sup>a</sup>	<b>122.5<sup>a</sup></b>	119.2 <sup>b</sup>	125.9 <sup>b</sup>	<b>122.5<sup>b</sup></b>
Feed conversion, g/g	2.070 <sup>a</sup>	2,212 <sup>a</sup>	<b>2.138<sup>a</sup></b>	1,999 <sup>b</sup>	2,078 <sup>b</sup>	<b>2.037<sup>b</sup></b>
Dirty eggs, %	3.7 <sup>a</sup>	4.4	<b>4.0<sup>a</sup></b>	3.0 <sup>b</sup>	4.0	<b>3.4<sup>b</sup></b>

+ 3.4 %  
+ 6.1 %  
+ 4.7 %

(Van der Klis and Lensing, 2007)



# Effect on nutrient digestibility and energy content \*\*

(Natugrain TS 100 g/t; 50% wheat, 10% rye)



Nutrient	Control	Natugrain TS
Organic matter, %	73.4 b	74.9 a
Fat, %	69.6	74.4*
Protein, %	79.4 b	80.4 a
Carbohydrates, %	71.9 b	73.2 a
AME <sub>N</sub> , kcal/kg DM	2868 a	2951 b

+ 83 kcal/kg DM  
+ 94 kcal/kg ADM  
+ 2.9 %

\*P = 0.064

\*\* digestibility study with 25 weeks old Dekalb hens

(Van der Klis and Lensing, 2007)

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(Natugrain TS 100 g/t; 50% wheat, 10% rye)

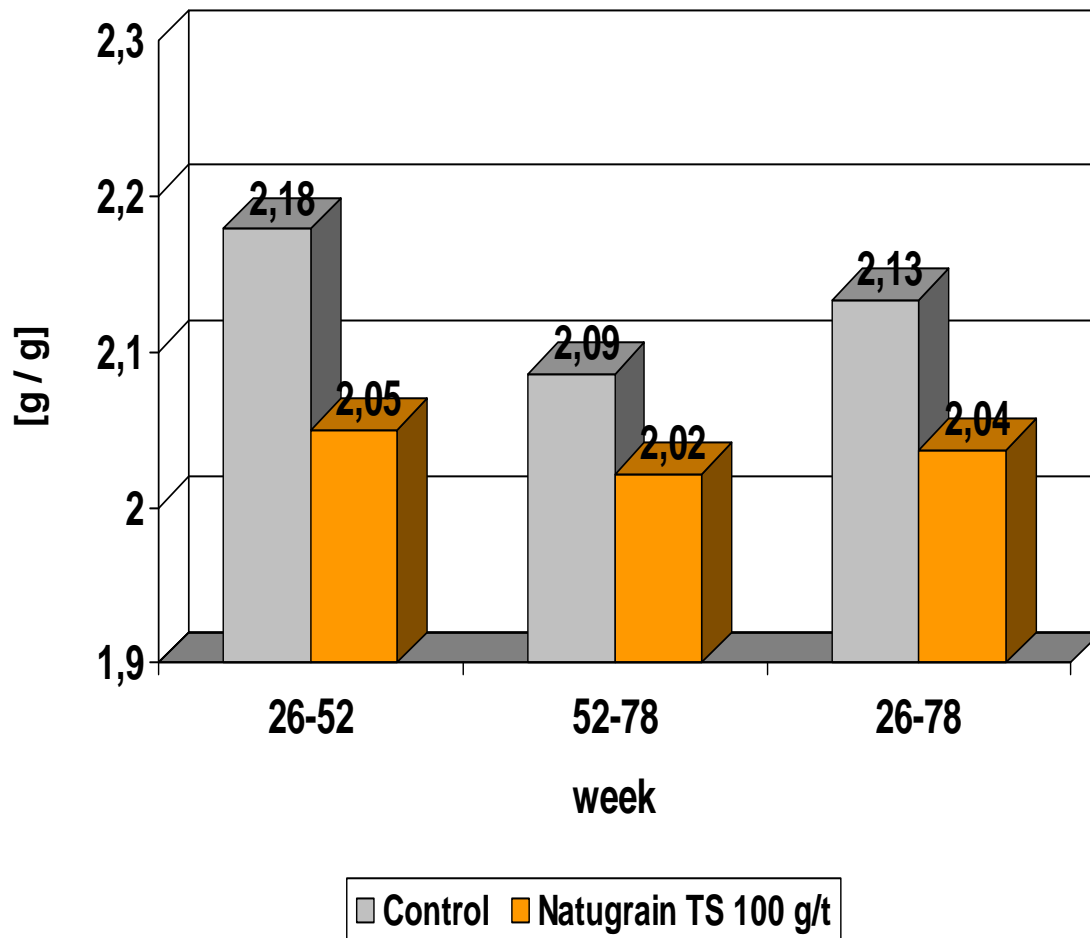


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Laying rate, %	93.6	87,0	<b>90.4</b>	93.2	87.2	<b>90.3</b>
Daily egg mass, g	57.6	57,0	<b>57.3</b>	57.4	57.3	<b>57.4</b>
Egg weight, g	61.5	65.5	<b>63.4</b>	61.6	65.7	<b>63.6</b>
Daily feed intake, g	119.2 <sup>a</sup>	125.9 <sup>a</sup>	<b>122.5<sup>a</sup></b>	114.8 <sup>b</sup>	119.0 <sup>b</sup>	<b>116.9<sup>b</sup></b>
Feed conversion, g/g	2.070 <sup>a</sup>	2.212 <sup>a</sup>	<b>2.138<sup>a</sup></b>			
<b>Dirty eggs, %</b>	3.7 <sup>a</sup>	4.4	<b>4.0<sup>a</sup></b>	3.0 <sup>b</sup>	4.0	<b>3.4<sup>b</sup></b>

-19%      -9%      -15%

(Van der Klis and Lensing, 2007)

## Effect on water: feed ratio (Natugrain TS 100 g/t; 50% wheat, 10% rye)



(Van der Klis and Lensing, 2007)

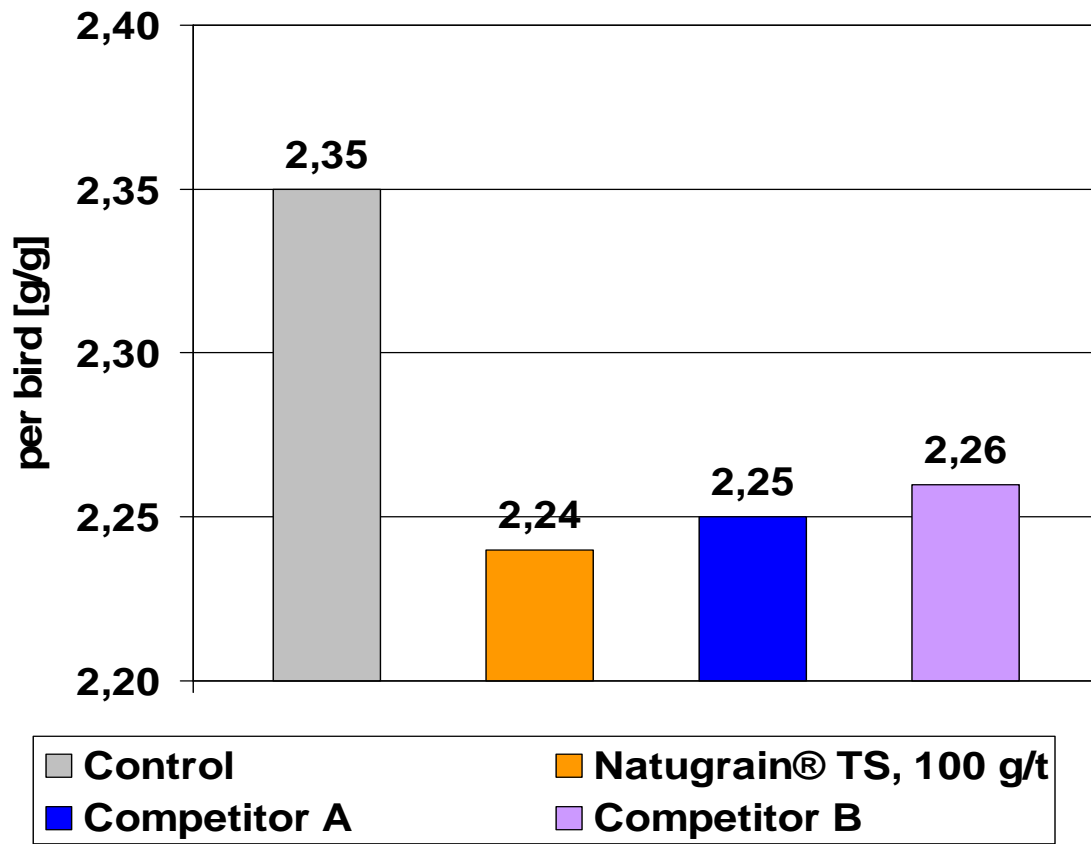
# Turkey feeding trial

Effect on Feed Conversion Rate

(Wheat & barley based diet, + Natuphos 5000 G (EU) 100 g/t)



Day 0 – 105 (15 weeks)



Source: BNA 2009

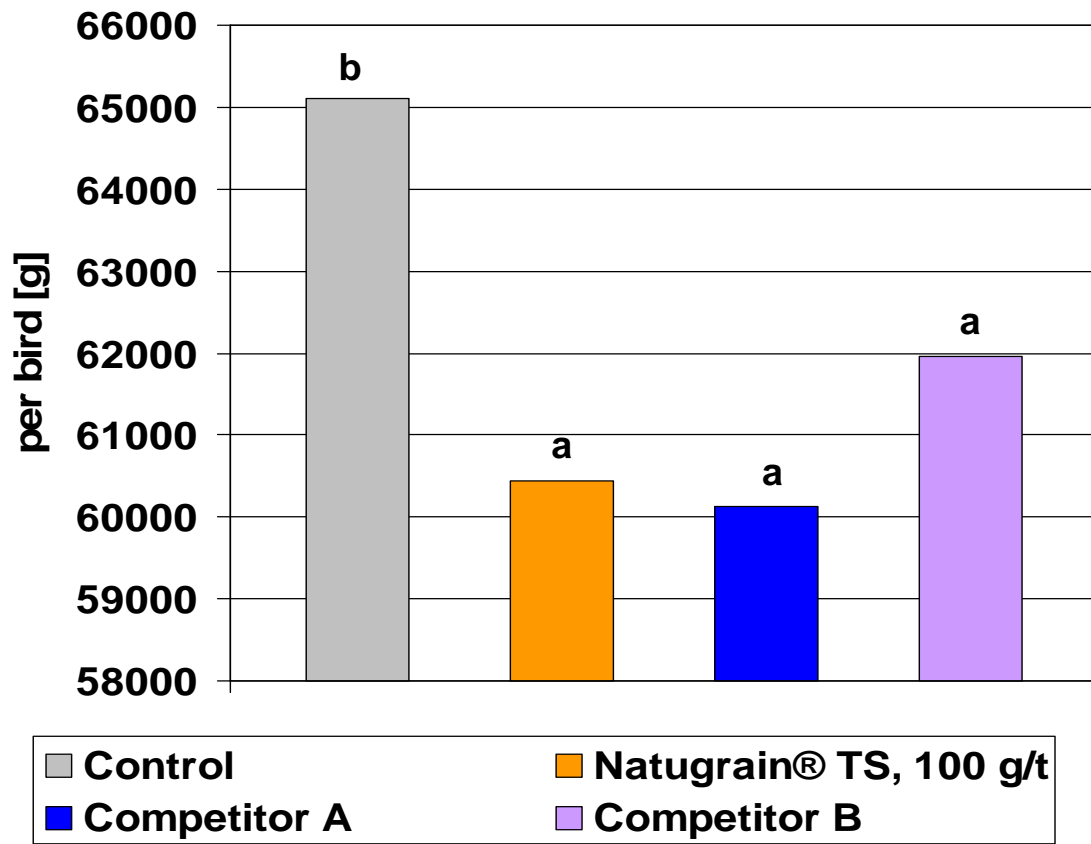
# Turkey feeding trial

## Effect on Water Intake

(Wheat & barley based diet, + Natuphos 5000 G (EU) 100 g/t)



Day 0 – 105 (15 weeks)



(P < 0.001)



Source: BNA 2009

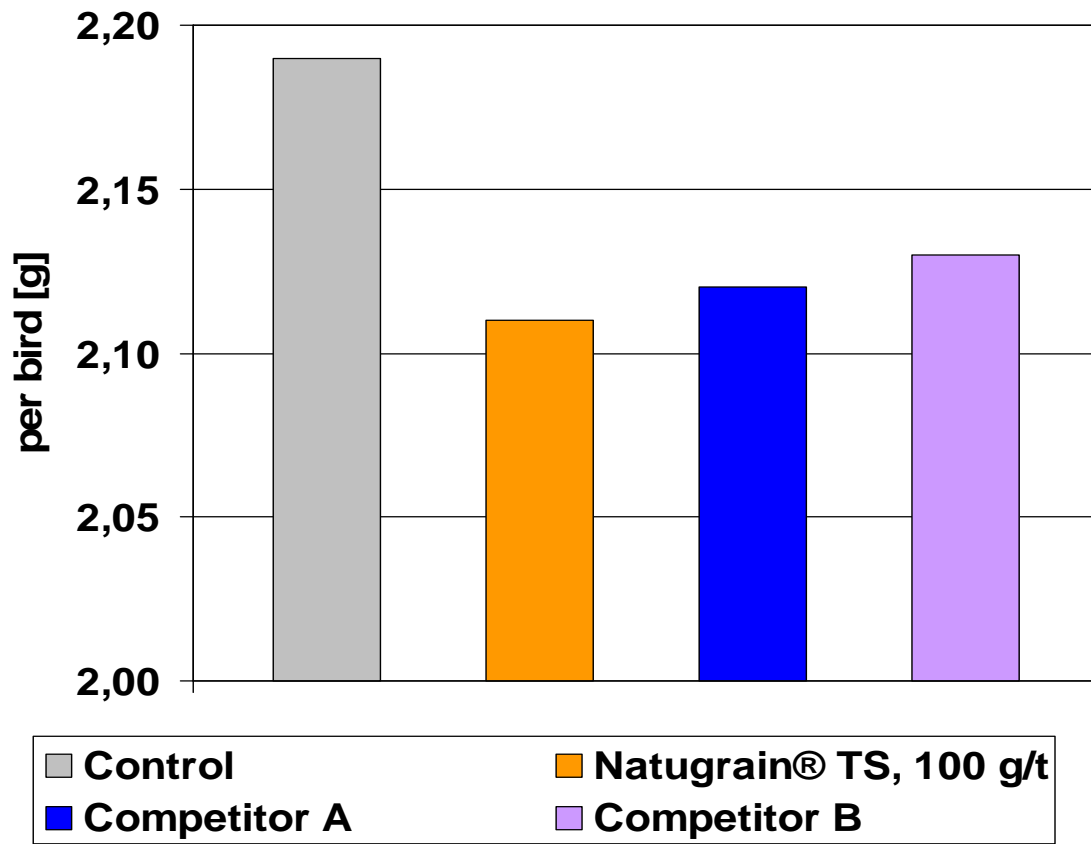
# Turkey feeding trial

Effect on Water / Feed Ratio

(Wheat & barley based diet, + Natuphos 5000 G (EU) 100 g/t)



Day 0 – 105 (15 weeks)

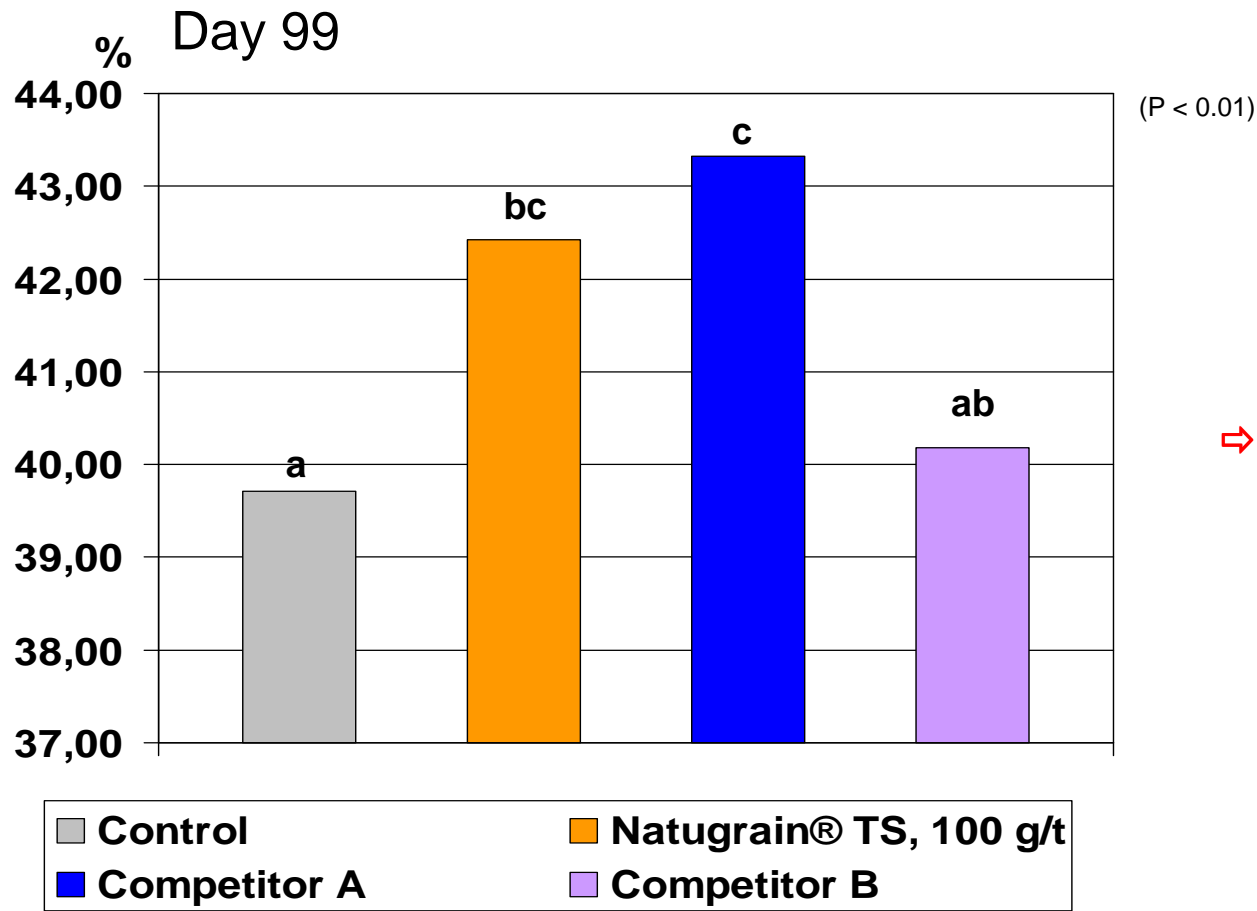


Source: BNA 2009

# Turkey feeding trial

Effect on Litter Dry Matter

(Wheat & barley based diet, + Natuphos 5000 G (EU) 100 g/t)



⇒ positive influence on hygienic conditions

Source: BNA 2009



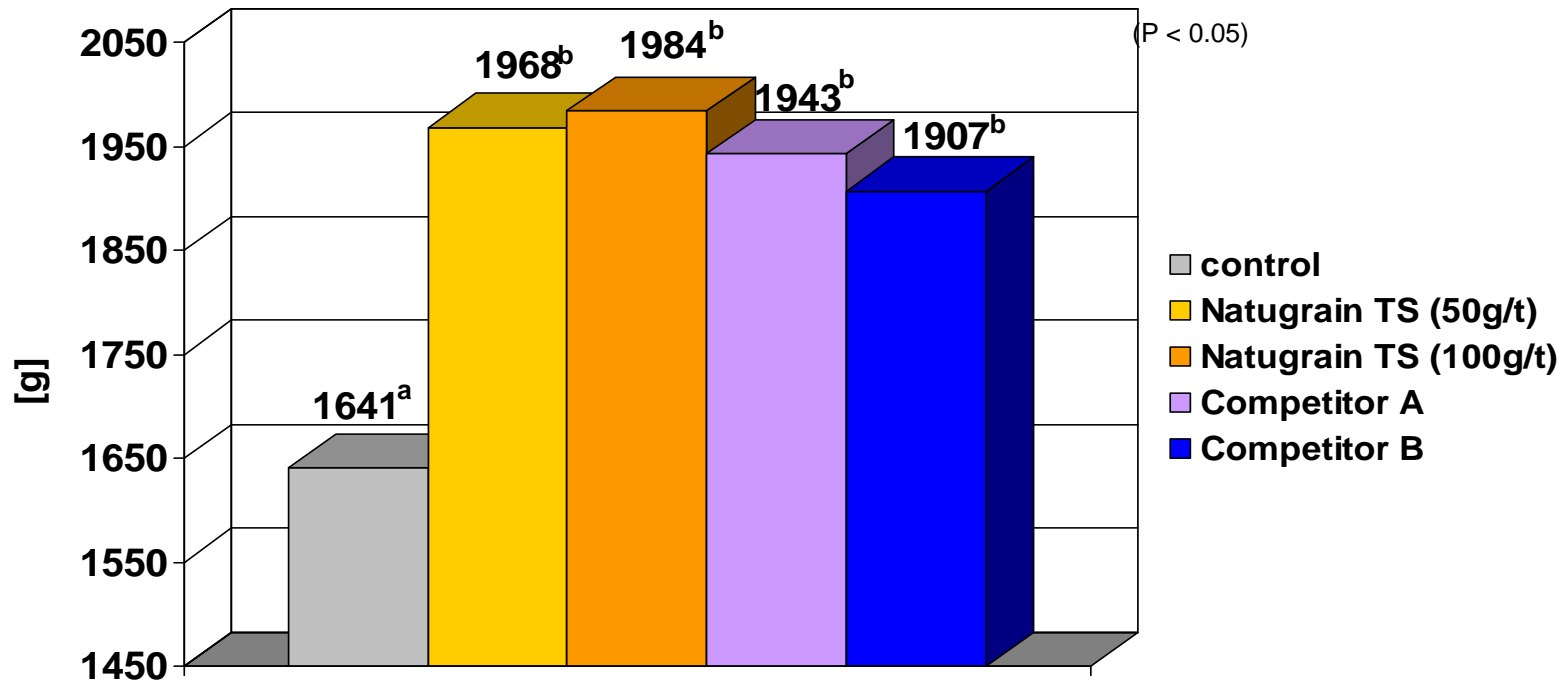
## Improvement in broiler performance (Wheat based diets)



Trial	Period (d)	Parameter	Control	Natugrain (100 g/t)	% improvement
Poznan, 2007	0-42	LW (g)	1959 <sup>a</sup>	2429 <sup>b</sup>	24.0
		FCR (g/g)	2.08 <sup>b</sup>	1.82 <sup>a</sup>	12.5
Feedtest, 2007	0-35	LW (g)	1866 <sup>a</sup>	2298 <sup>b</sup>	23.2
		FCR (g/g)	2.20 <sup>b</sup>	1.80 <sup>a</sup>	18.0
BASF, 2007 a	0-35	LW (g)	1976 <sup>a</sup>	2136 <sup>b</sup>	8.1
		FCR (g/g)	1.94 <sup>b</sup>	1.60 <sup>a</sup>	17.5
BASF, 2007 b	0-35	LW (g)	1866 <sup>a</sup>	2298 <sup>b</sup>	23.2
		FCR (g/g)	2.20 <sup>b</sup>	1.80 <sup>a</sup>	18.2

# Broiler feeding trial

Effect on Final body weight  
Wheat 50-55%, barley 10-12%



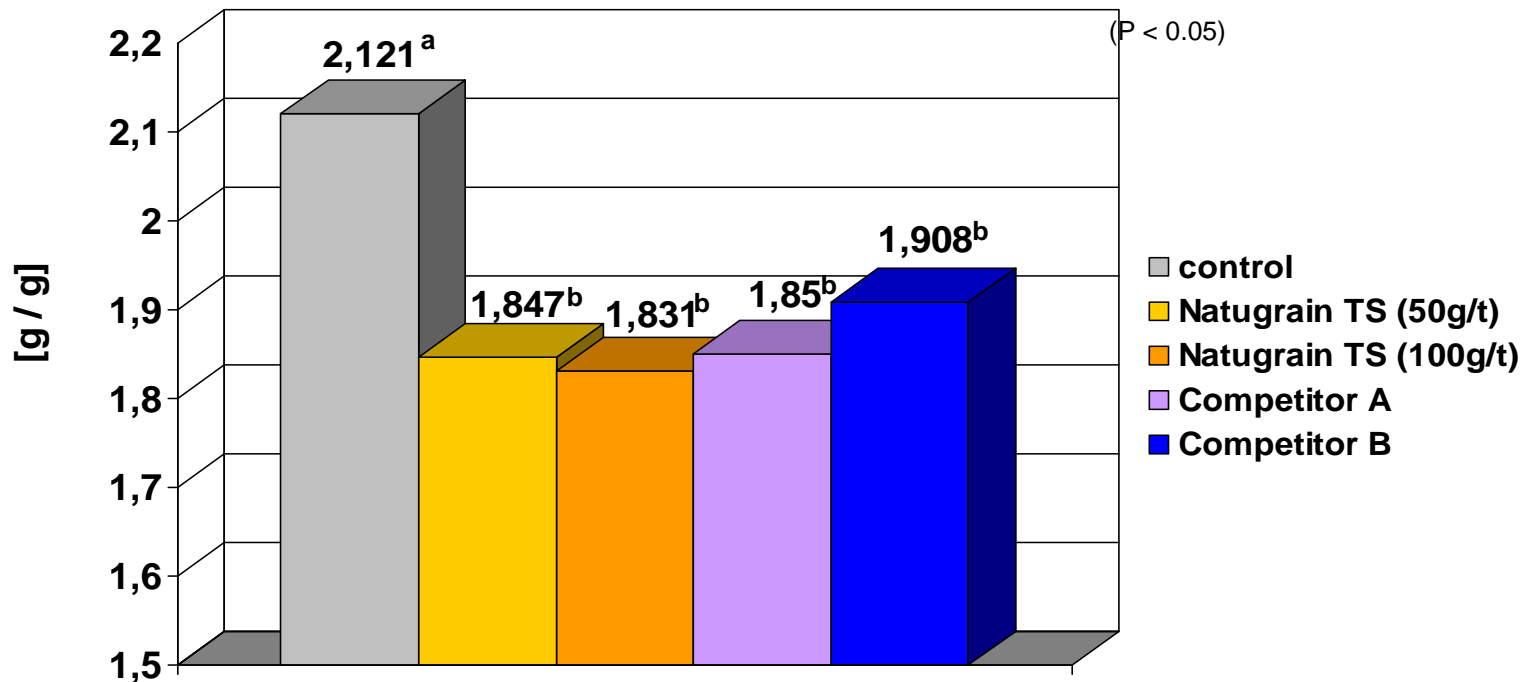
⇒ All products tested improved final body weight significantly versus control  
Natugrain TS showed best performance even at a dosage of 50 g/t

Source: BASF 2008

# Broiler feeding trial

## Effect on Feed Conversion Rate

Wheat 50-55%, barley 10-12%



⇒ All products tested improved feed conversion rate significantly vs control  
Natugrain TS showed best performance even at a dosage of 50 g/t

Source: BASF 2008

# Litter Score

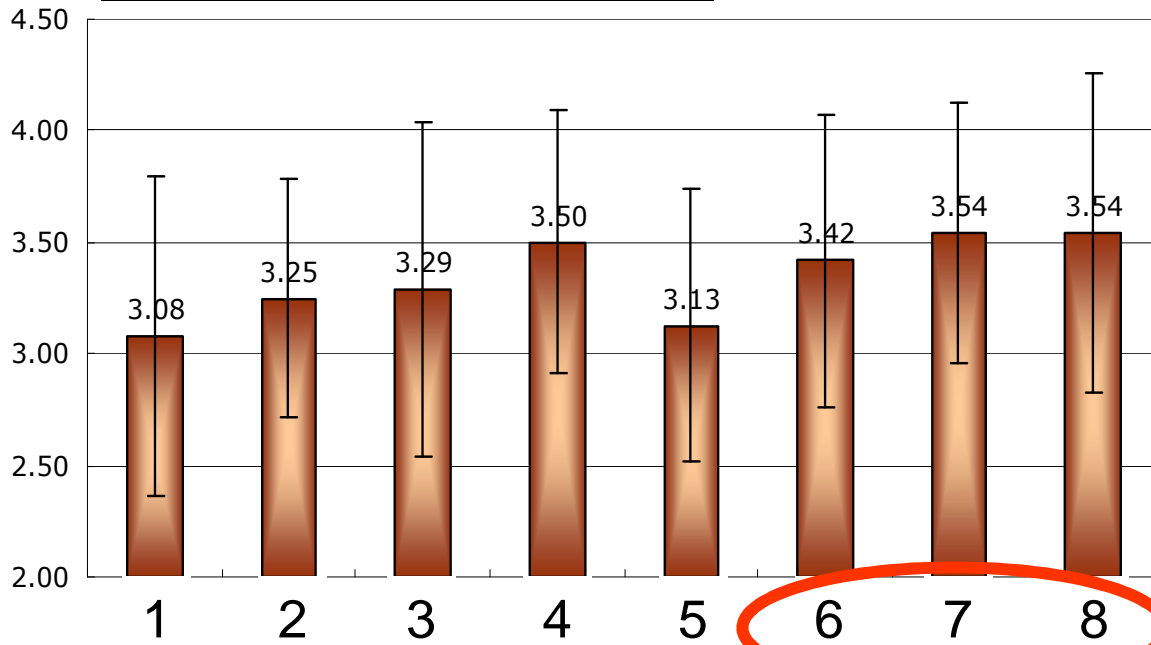
Broiler trial (Ross: day 28)



Diet	Average
Wheat	60.0
Corn	8.0
Soy	25.1
Soy oil	0.2
Palm oil	3.0



Group	Enzyme	Dose (g/T)
1	Negative Control	-
2	Competitor A	50
3	Competitor B	100
4	Competitor C	150
5	Competitor D	20
6	Natugrain Wheat TS	50
7	Natugrain Wheat TS	100
8	Natugrain TS	100



categories:

- 4 = normal
- 3 = less dirty
- 2 = dirty
- 1 = very dirty

Source: BNA, 2006

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## Conclusions



- Approvals for major animal species allow multiple and flexible use
- Significantly improved animal performance due to high efficacy in cereal based diets
- Pronounced positive effects on faeces and litter quality
- Adds flexibility for diet composition
- Exceptional stability and excellent processing properties ensure a reliable and consistent performance

**TAKE THE CHANCE. PICK THE ECONOMICAL SOLUTION !**

**Natugrain TS – the highly effective and flexible NSP-Enzyme**

# The end



**Thank you very much for your attention**





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