

natuphos®E

**BASF**  
We create chemistry

## Natuphos® E 5000 Combi

Combined enzymes that work for pigs, poultry, aquaculture, your business and the environment



The ideal combination of enzymes delivering:

- Improved digestion of nutrients
- Outstanding stability in feed processing
- Superior animal performance
- Enhanced resource efficiency

**The science of sustainable feed that succeeds**



[animal-nutrition.basf.com](http://animal-nutrition.basf.com)

## Over three decades of enzyme expertise

BASF first introduced phytase to animal nutrition more than 30 years ago. Since then, we have pioneered the formulation and production of Natuphos® E, our safe, reliable phytate phosphorus releasing enzyme for sustainable pig, poultry and aquaculture nutrition.

Ongoing research has enabled us to continue evolving our enzyme portfolio and we have added two non-starch polysaccharide (NSP) hydrolysing enzymes – an endo-1, 4-beta-xylanase and an endo-1, 4-beta-glucanase – which we combined in a single product, called Natugrain® TS.

Now all three enzymes are available in one. We call it Natuphos® 5000 Combi.

### Our 3-in-1 solution:

- Natuphos® E
  - Natugrain® TS – 1, 4-beta-xylanase
  - Natugrain® TS – 1, 4-beta-glucanase
- = Natuphos® E 5000 Combi

## The 3-in-1 combination that improves performance, efficiency and sustainability

Natuphos® E 5000 Combi primarily supports animals' use of energy, protein and amino acids from feed plants. But also – particularly in poultry – the addition of Natugrain® TS to feed reduces digesta viscosity and water excretion, an indication of its potential impacts on animal vitality.

### The 3-in-1 nature of Natuphos® E 5000 Combi delivers a number of improvements in:

- Optimal use of dietary energy
- Reduced inorganic phosphorus levels in diets
- Better use of dietary nutrients, such as P, AAs, Zn, Na
- 40-50% less phosphorus excretion
- And less land required for manure disposal

**Natuphos® E 5000 Combi G** – granulated for use in premix, basemix, mash and in pelleted feed.

**Natuphos® E 5000 Combi L** – liquid for post-pelleting liquid application (PPLA) to pelleted feed.

**Specifically** – the approved formulation contains the three enzymes:

- **Phytase** – 5000 FTU of hybrid bacterial 6-phytase per gram
- **Xylanase** – 5600 TXU of endo-1,4-beta-xylanase per gram
- **Glucanase** – 2500 TGU of endo-1,4-beta-glucanase per gram

**The standard recommended dosage:** is 100 grams per MT of feed. This means that the same amounts of Natuphos® E 5000 or Natugrain® TS can be used without any adjustment.

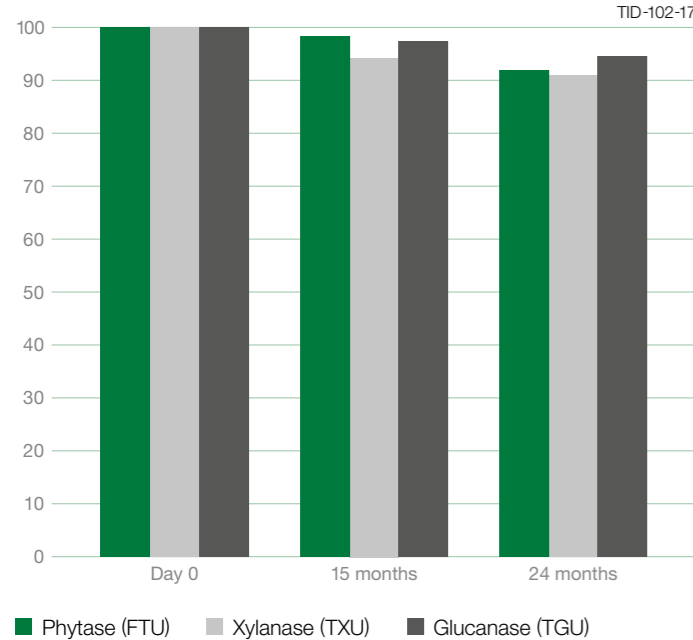


## Both Natuphos® E 5000 Combi formulations have excellent shelf life

Based on highly sophisticated enzyme engineering, in sealed packages at 20°C, Natuphos® E 5000 Combi G can be stored for 24 months from the date of production; Natuphos® E 5000 Combi L for 18 months. This shelf life after production is guaranteed when the products are stored in their original sealed packaging, in a dry place, at 20°C or less. However, they will tolerate temperatures above 30°C for a period of time – see Figure 1.

### Natuphos® E 5000 Combi G

#### Recovery of enzyme activity (%)



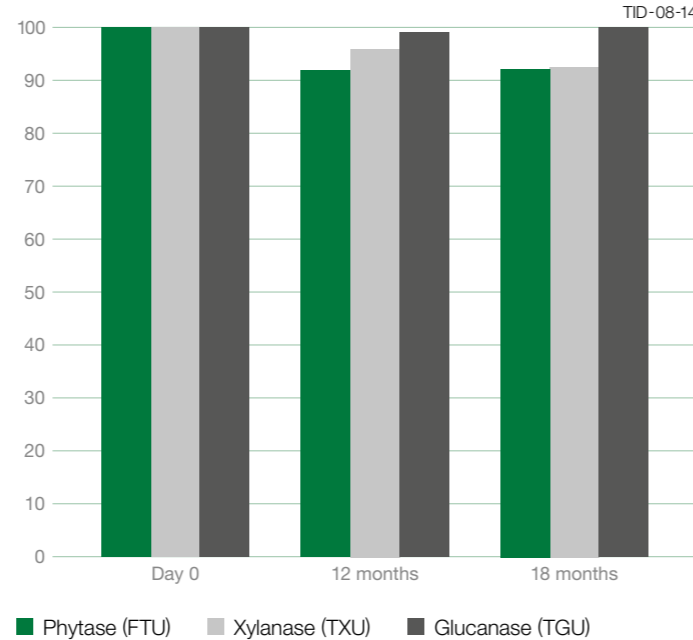
## The benefits in handling the two 3-in-1 formulations are very considerable

Our 3-in-1 enzyme formulations have many significant advantages as compared to single enzyme products:

- Less storage space
- Fewer silos for micro-components
- Simplified logistics and product handling
- Less waste due to reduced packaging
- Reduced volumes of premix and basemix recipes
- Fewer pumps and nozzles in case of PPLA application

### Natuphos® E 5000 Combi L

#### Recovery of enzyme activity (%)



**Figure 1: Shelf life stability at 20°C storage temperature (means from 3 batches)**

Units of the phytase in Natuphos® E  
 FTU: phytase units  
 TXU: thermostable xylanase units  
 TGU: thermostable glucanase units

## Pelleting trail

### Natuphos® E 5000 Combi G

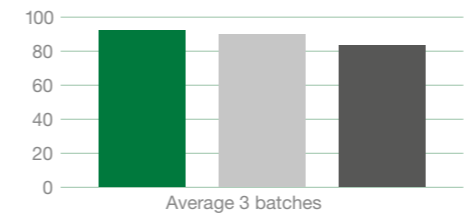
Granulated for use in premix, basemix, mash and pelleted feed at temperatures up to 95°C – see Figure 2.

### Natuphos® E 5000 Combi L

Liquid for post-pelleting liquid application (PPLA) for pelleted feed at temperatures significantly above 95°C if LTC or expander technologies are in use.

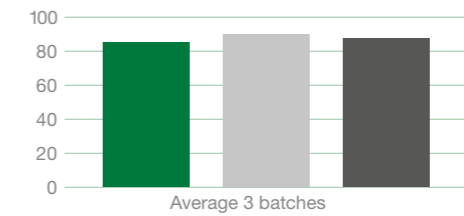
#### Recovery of phytase activity

% per batch and run 6 subsamples were analysed



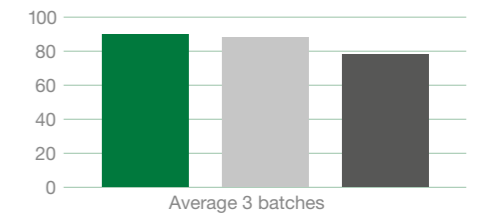
#### Recovery of xylanase activity

% per batch and run 6 subsamples were analysed



#### Recovery of glucanase activity

% per batch and run 6 subsamples were analysed



30s conditioning time. Pelleting temperature at: ■ 85°C ■ 90°C ■ 95°C

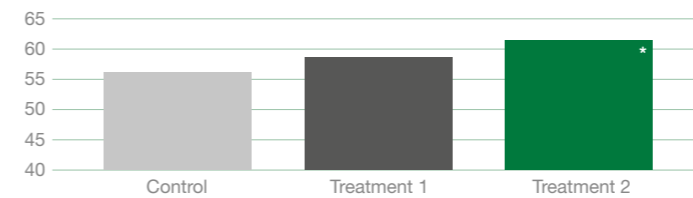
TID-106-21

**Figure 2: Stability during pelleting at 95°C**

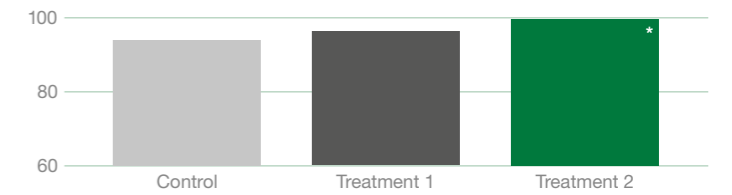
## Convincing feeding trial results

Treatment	Energy level of diet
C: Control with Natuphos® E (1000 FTU/kg)	-90 kcal AME <sub>N</sub> /kg compared to recommendation
T1: C + Natugrain® TS (560 TXU/259 TGU per kg)	-50 kcal AME <sub>N</sub> /kg compared to C
T2: C + Natugrain® TS (560 TXU/259 TGU per kg)	-120 kcal AME <sub>N</sub> /kg compared to C

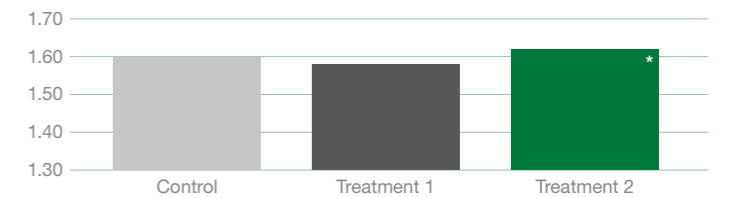
#### Daily body weight gain, day 1-35 (g)



#### Daily feed intake, day 1-35 (g)



#### Feed conversion ratio, day 1-35 (g/g)



■ Natuphos® E ■ Natuphos® E 5000 Combi T1 ■ Natuphos® E 5000 Combi T2

TID-71-20

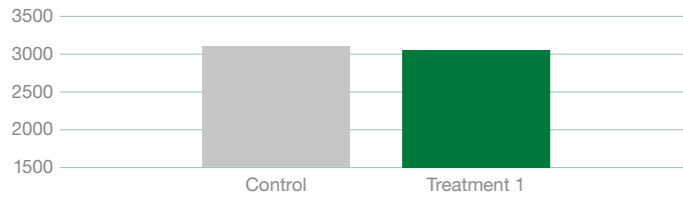
**Figure 3: Broiler feeding trial combining Natuphos E and Natugrain TS**

\*Indicates significant difference against Control (p< 0.05)

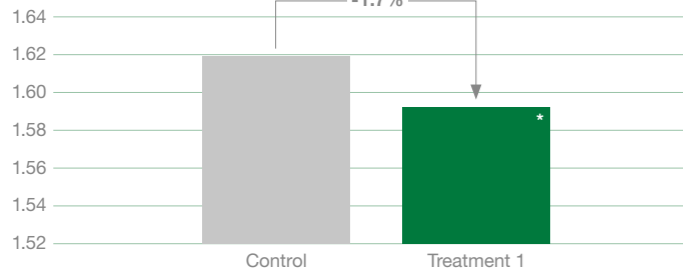
## Convincing feeding trial results (Continued)

Controlled feeding trials in broiler-fed pelleted wheat/corn/soybean meal based diets. Control diets formulated with 500 FTU/kg Natuphos® E by considering all matrix values of the Natuphos® E matrix for broilers at the given dose level (e.g. 69 kcal/kg for AME). Additional supplementation of the diet with Natugrain® TS significantly improved broiler performance – see Figure 3a. Viscosity of ileal digesta was also significantly decreased – Figure 3a. The latter is believed to play a pivotal role in improving nutrient and energy digestibility – see Figure 3b.

**Equal level of body weight, day 42 (g)**



**Feed conversion ratio, day 1-42 (g/g)**



■ Natuphos® E ■ Natuphos® E 5000 Combi

**Figure 3a: Broiler feeding trial combining Natuphos® E and Natugrain® TS**

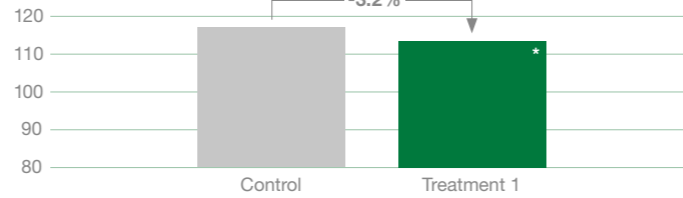
\*Indicates significant difference against Control ( $p \leq 0.05$ )

Treatment	calc. AME level of diets
C: Control with Natuphos® E (500 FTU/kg*)	2850/2900/2975 kcal/kg**
T1: C + Natugrain® TS (560 TXU/250 TGU per kg)	2850/2900/2975 kcal/kg**

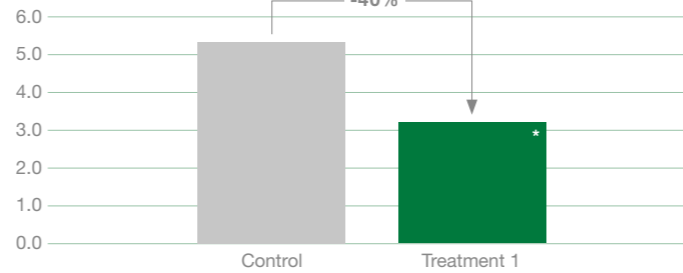
\*Contributes 69 kcal/kg (AME) – Natuphos® E matrix value

\*\*Three phase feeding for 42 days

**Feed intake, day 1-42 (g per day)**



**Viscosity of ileal digesta, day 31 (mPa<sub>s</sub>)**

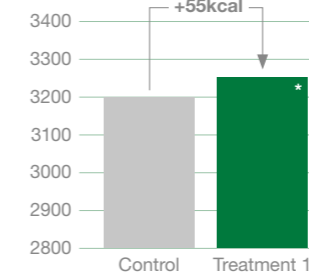


TID-48B-18

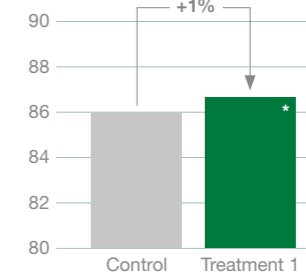
Treatment	calc. AME level of diets
C: Control with Natuphos® E (500 FTU/kg*)	2900 kcal/kg
T1: C + Natugrain® TS (560 TXU/250 TGU per kg)	2900 kcal/kg

\*Contributes 69 kcal/kg (AME) – Natuphos® E matrix value

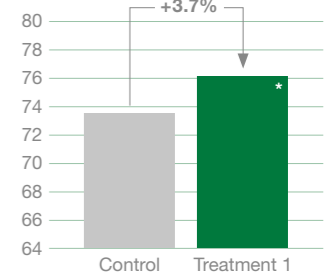
**AME, day 25-27 (kcal/kg)**



**Total tract digestibility – crude protein, day 25-27 (%)**



**Total tract digestibility – crude fat, day 25-27 (%)**



■ Natuphos® E ■ Natuphos® E 5000 Combi

TID-46-19

**Figure 3b: Broiler feeding trial combining Natuphos® E and Natugrain® TS**

\*Indicates significant difference against Control ( $p \leq 0.05$ )



Natuphos® E 5000 Combi G



Natuphos® E 5000 Combi L

## Choose the Natuphos® E 5000 Combi formulations that are right for you

Product name	Form	Application	Shelf life	Packaging	Article number
Natuphos® E 5000 Combi G	Granulate	Hybrid 6-phytase (5,000 FTU/g), endo-1,4- beta-xylanase (5,600 TXU/g), and endo-1,4- beta-glucanase (2,500 TGU/g), recommended for non-pelleted feed or pelleting up to 95°C	24 mo.	20 Kg cardboard boxes with PE inliner	50470843
Natuphos® E 5000 Combi L	Liquid	Hybrid 6-phytase (5,000 FTU/g), endo-1,4- beta-xylanase (5,600 TXU/g) and endo-1,4- beta-glucanase (2,500 TGU/g); recommended for post-pelleting applications	18 mo.	125 Kg plastic drum 1000 Kg IBC	50425767 50425769

## Contacts

### Asia/Pacific

BASF South East Asia Pte. Ltd.  
Animal Nutrition, Asia/Pacific  
7 Temasek Boulevard, #35-01  
Singapore 038987  
Singapore  
Phone: +65-6337-0330  
Fax: +65-6432-3298  
E-mail: [animalnutrition-asia-pacific@basf.com](mailto:animalnutrition-asia-pacific@basf.com)

### North America

BASF Corporation  
Animal Nutrition, North America  
100 Park Avenue  
Florham Park, New Jersey 07932  
USA  
Phone: +1-800-527-9889  
Fax: +1-973-245-6766  
E-mail: [animalnutrition-north-america@basf.com](mailto:animalnutrition-north-america@basf.com)

### Europe, Africa, West Asia

BASF SE  
Animal Nutrition, Europe  
Chemiestrasse 22  
68623 Lampertheim  
Germany  
Phone: +49-621 60-28073  
Fax: +49-621 60-28363  
E-mail: [animalnutrition-europe@basf.com](mailto:animalnutrition-europe@basf.com)

### South America

BASF S.A.  
Animal Nutrition, South America  
Avenida das Nações Unidas 14.171 – 10th floor  
04794-000 São Paulo SP  
Brazil  
Phone: +55-11-2039-2292  
Fax: +55-11-2039-2344  
E-mail: [animalnutrition-south-america@basf.com](mailto:animalnutrition-south-america@basf.com)

This document, or any information provided herein does not constitute a legally binding obligation of BASF and has been prepared in good faith and is believed to be accurate as of the date of issuance. Unless expressly agreed otherwise in writing in a supply contract or other written agreement between you and BASF:

- To the fullest extent not prohibited by the applicable laws, BASF EXPRESSLY DISCLAIMS ALL OTHER REPRESENTATIONS, WARRANTIES, CONDITIONS OR GUARANTEES OF ANY KIND, WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, BY FACT OR LAW, INCLUDING ANY IMPLIED WARRANTIES, REPRESENTATIONS OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, SATISFACTORY QUALITY, NON-INFRINGEMENT, AND ANY REPRESENTATIONS, WARRANTIES, CONDITIONS OR GUARANTEES, ARISING FROM STATUTE, COURSE OF DEALING OR USAGE OF TRADE and BASF HEREBY EXPRESSLY EXCLUDES AND DISCLAIMS ANY LIABILITY RESULTING FROM OR IN CONNECTION WITH THIS DOCUMENT OR ANY INFORMATION PROVIDED HEREIN, including, without limitation, any liability for any direct, consequential, special, or punitive damages relating to or arising therefrom, except in cases of (i) death or personal injury to the extent caused by BASF's sole negligence, (ii) BASF's willful misconduct, fraud or fraudulent misrepresentation or (iii) any matter in respect of which it would be unlawful for BASF to exclude or restrict liability under the applicable laws;
- Any information provided herein can be changed at BASF's sole discretion anytime and neither this document nor the information provided herein may be relied upon to satisfy from any and all obligations you may have to undertake your own inspections and evaluations;
- BASF rejects any obligation to, and will not, automatically update this document and any information provided herein, unless required by applicable law; and
- This document or any information provided herein must not be used for purposes of pharmaceutical registrations.
- The registration status of different countries has to be considered.

If you have any further questions or need additional support, please contact your BASF sales representative.