

Natupulse[®] TS

Driving digestion for sustainable poultry production



Natupulse[®] TS contains β -mannanase that supports sustainable animal protein production by:

- Decreasing digesta viscosity
- Increasing nutrient and energy digestibility
- Improved feed utilization

The science of sustainable feed that succeeds



The negative effects of anti-nutritional factors

Feed contributes up to 70% of the total cost of broiler production. A significant amount of nutrients, up to 30%, is indigestible.

The presence of Non Starch Polysaccharides (NSPs) is one of the key reasons for this indigestible fraction. NSPs are complex carbohydrates which make up the majority of fiber structures in plant cell walls¹.

NSPs are considered anti-nutritional factors in broiler feed since broilers lack the endogenous enzymes to digest these compounds².

One of the most common NSPs in soybean meal is galactomannan (a β -mannan) which acts as a storage and structural polysaccharide³. Soybean meal is the main protein source in commercial broiler diets and thus delivers the majority of β -mannans⁴.

The β -mannan level in soybean meals can vary to a great extent⁴.

Soluble β -mannans can impair animal performance by increasing the digesta viscosity⁵. Increased digesta viscosity can:

- Decrease nutrient absorption
- Lower energy and nutrient digestibility
- Favour pathogen growth

The presence of anti-nutritional factors like β -mannans in the diet can decrease the profitability of poultry production.

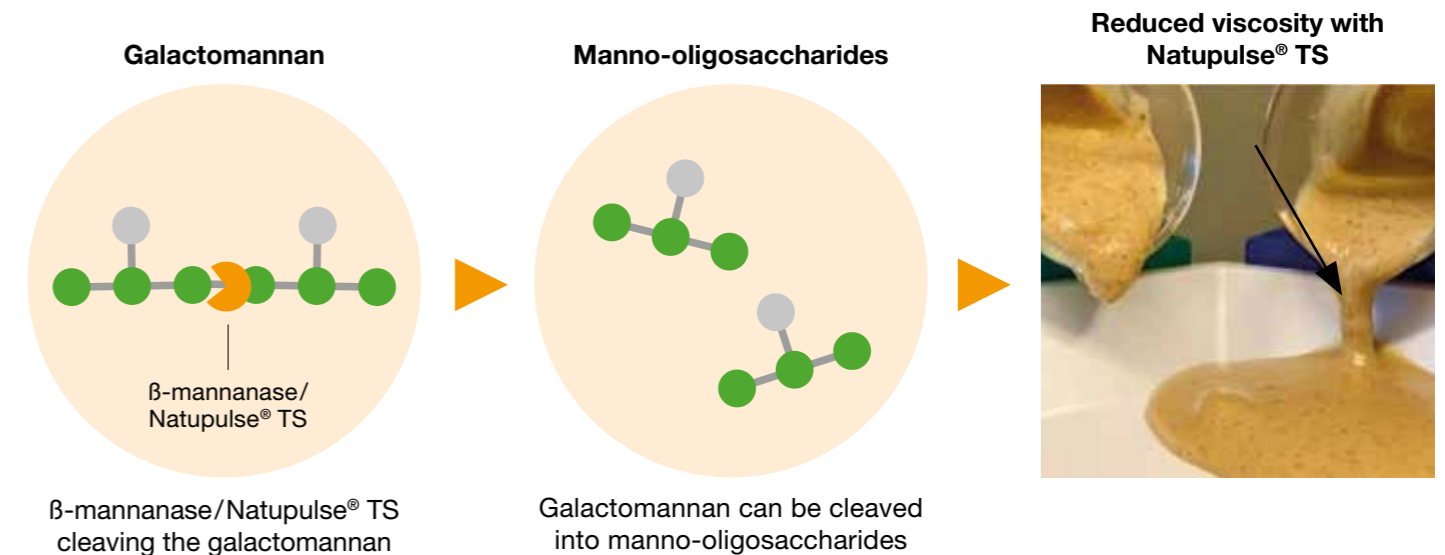
Endogenous digestive enzymes (e.g. proteases or lipases) might not be able to enter cells due to intact cell walls

Positive effects when adding β -mannanase in poultry feed

Adding β -mannanase to the feed decreases digesta viscosity, thereby increasing the digestibility of feed which has a positive effect on the animal.

Natupulse[®] TS is an NSP enzyme. As an endo-1,4- β -D-mannanase, it hydrolyzes β -mannans into smaller particles, e.g. manno-oligosaccharides (MOS). This has an effect on the viscosity of the feed and therefore the digestibility.

Our own studies have shown that Natupulse[®] TS reduces the digesta viscosity in diets with different feed compositions.



As a result, by reducing the digesta viscosity, Natupulse[®] TS is able to increase the nutrient and energy digestibility and thereby improved feed utilization.

Natupulse® TS supports feed utilization based on three interactive modes of action

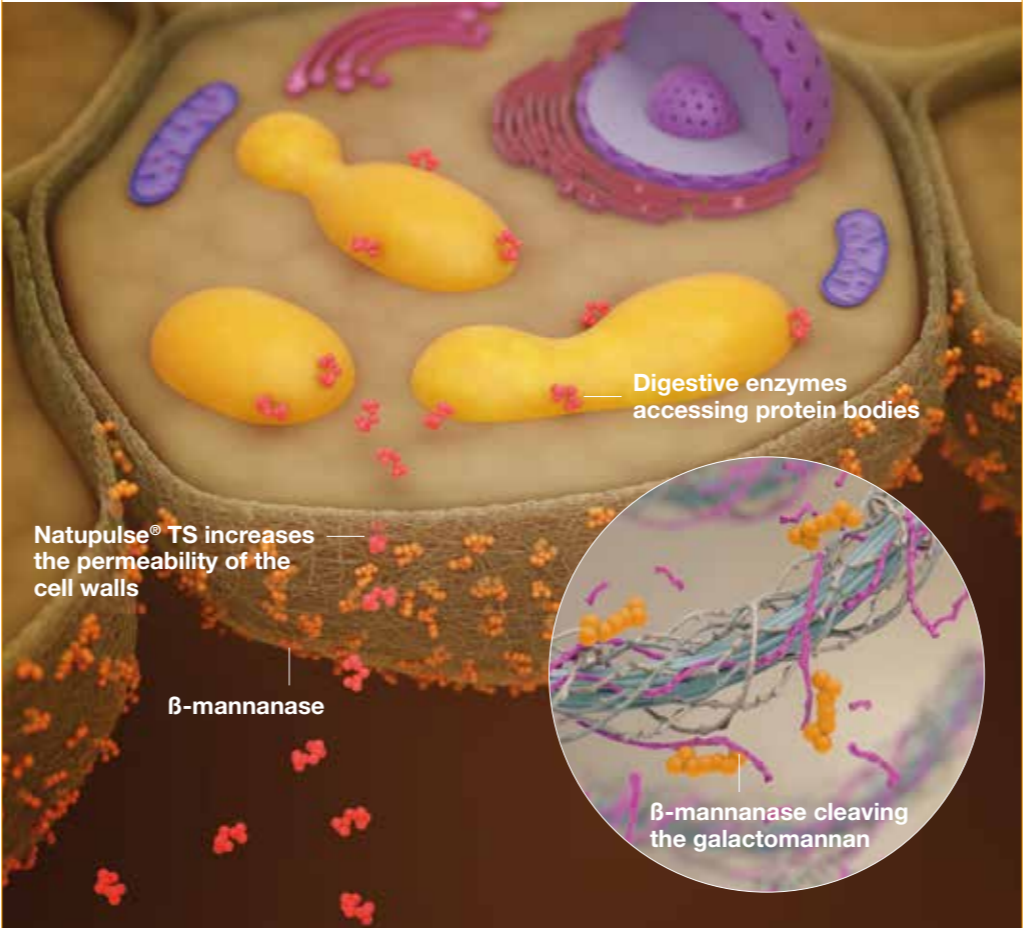
Mode of action 1 Reducing viscosity

Natupulse® TS reduces the digesta viscosity and improves the nutrient digestibility by enhancing the diffusion of endogenous enzymes with the respective substrate.



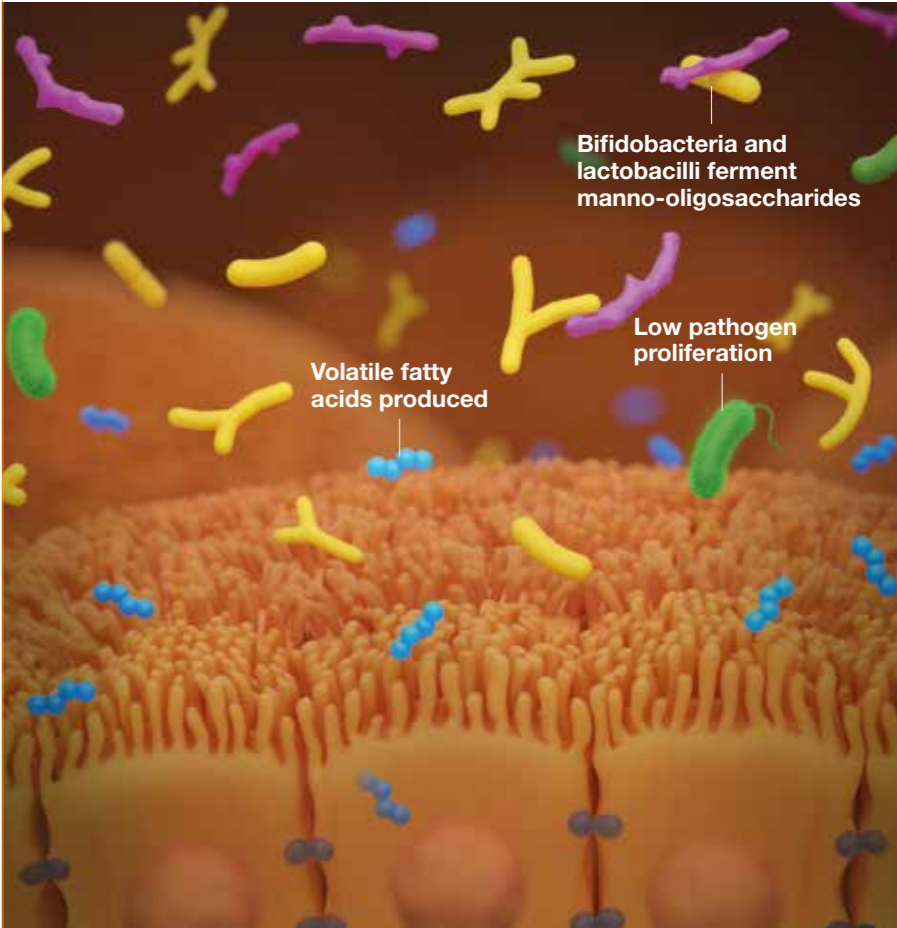
Mode of action 2 Increasing permeability

Natupulse® TS supports an increase in permeability of intact soybean cell walls. Therefore, more nutrients can be utilized by the animal.



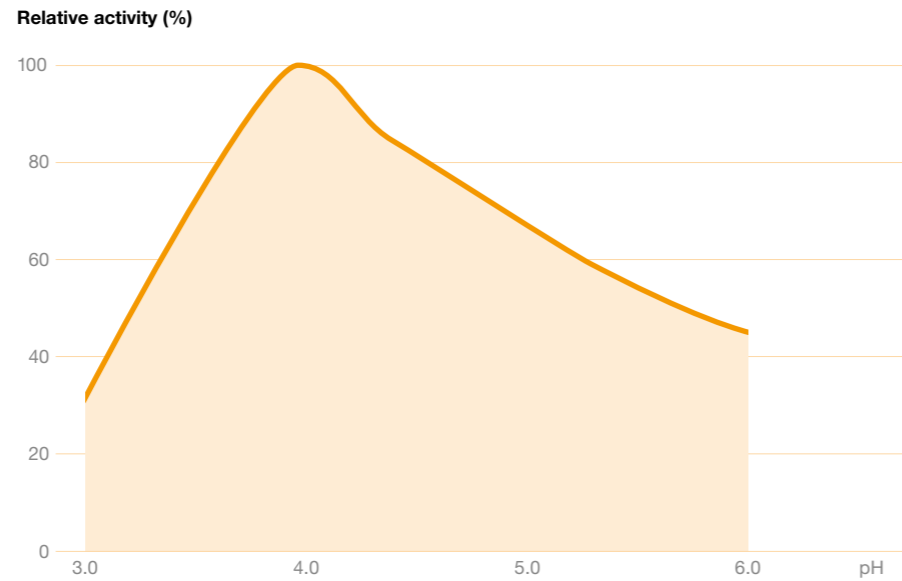
Mode of action 3 Prebiotic-like effect

Natupulse® TS cleaves β -mannans resulting in manno-oligosaccharides (MOS), which are known to show prebiotic effects.



Natupulse® TS is optimally adapted to the pH profile of the gastrointestinal tract of growing poultry

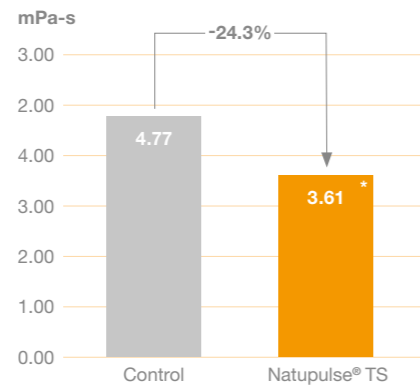
Natupulse® TS shows its highest activity at a lower pH range and can be active from the beginning of the gastrointestinal tract onwards. The negative effects of the β -mannans can be reduced at a very early stage.



Natupulse® TS supplementation significantly decreased the ileal digesta viscosity and significantly increased the content of apparent metabolizable energy in broiler feed

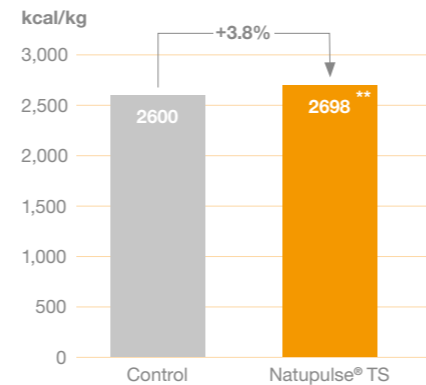


Ileal digesta viscosity, day 20



AMEn, day 20

TID-62-19



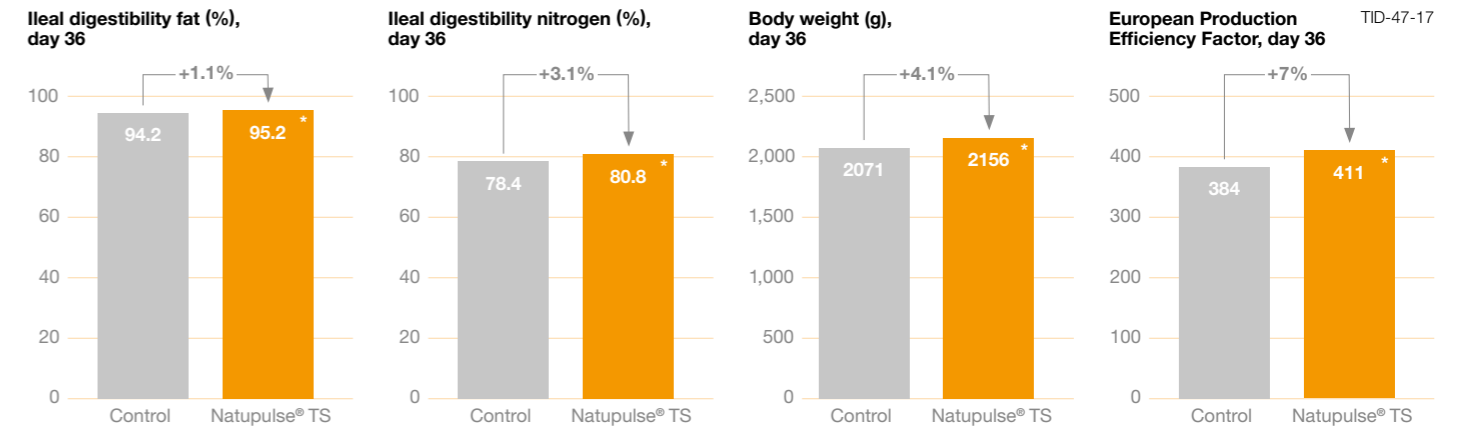
Values with symbols are different from Control (*P<0.1 and **P<0.05)

Natupulse® formulations have excellent stability

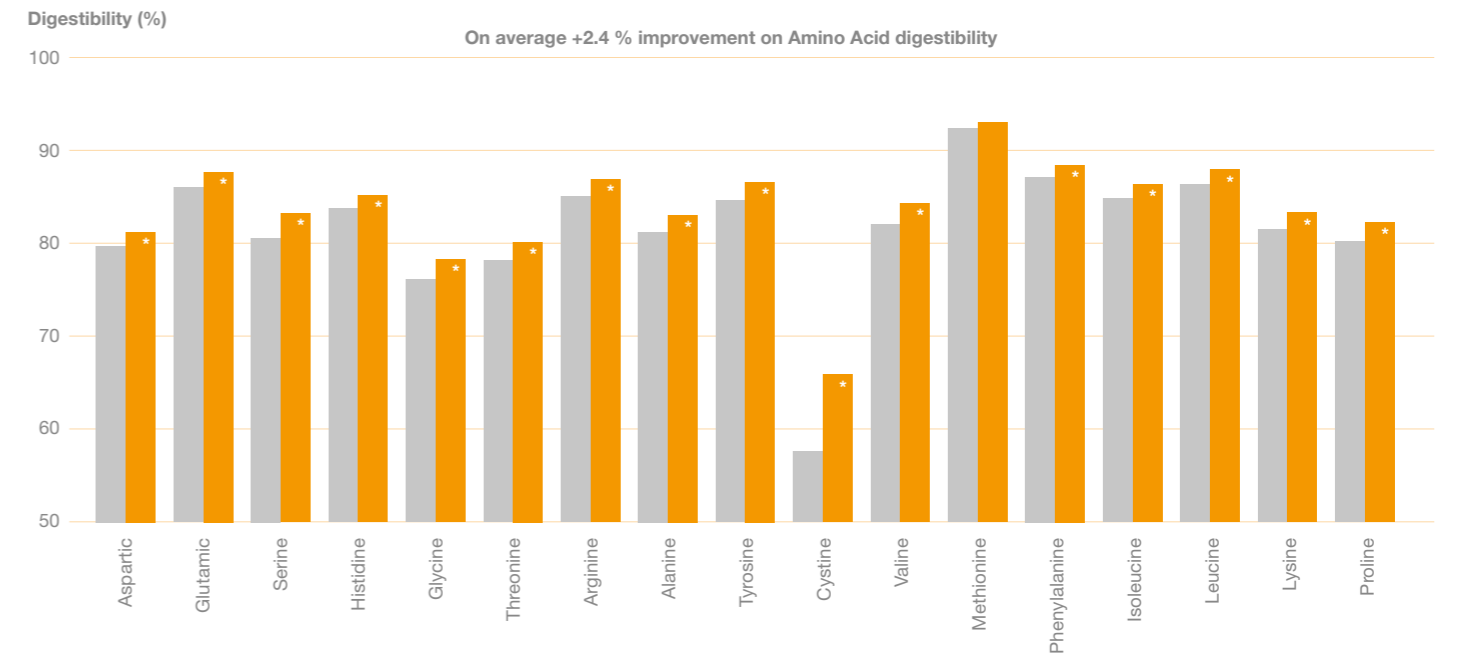
- Excellent shelf-life stability when stored at $\leq 20^{\circ}\text{C}$
- High stability under challenging conditions e.g. higher temperature and humidity
- Excellent stability in premixes
- High stability during pelleting

Natupulse® TS improves the digestibility of nutrients and energy

Positive impact on the animal by improved nutrient digestibility of a corn-based diet

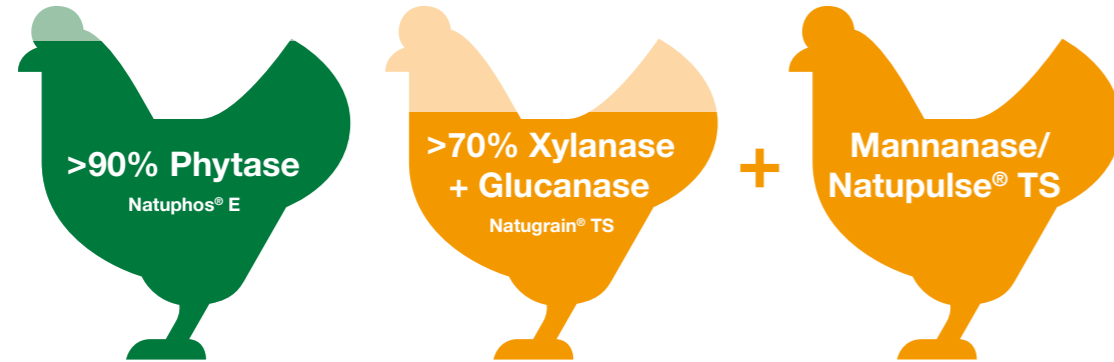


Ileal Amino Acid digestibility, day 36 TID-47-17



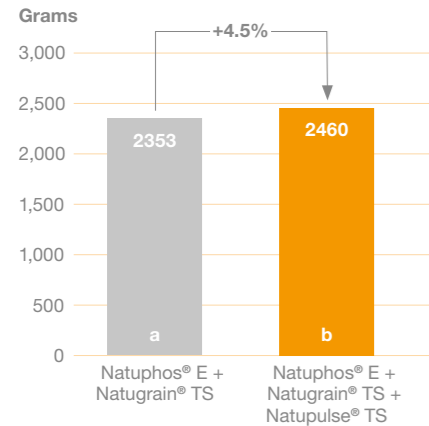
*Indicates significant difference against Control (p ≤ 0.05)

Natupulse® TS, Natuphos® E and Natugrain® TS in the same diets have a positive impact on broilers' improved feed utilization

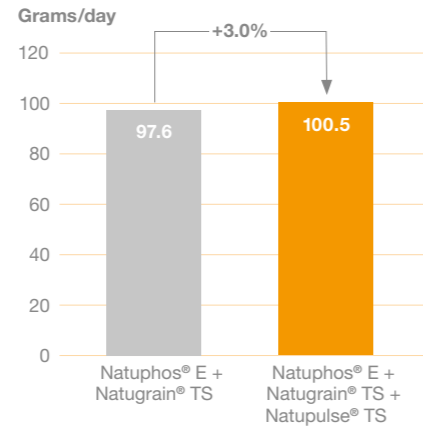


Most commercial broiler diets already contain phytase and xylanase alone or in combination with glucanase. Even when using these enzymes in combination, the addition of Natupulse® TS gives an additional advantage

Body weight gain, day 1-35

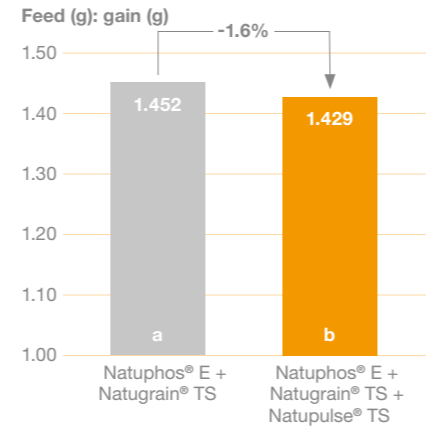


Average daily feed intake, day 1-35



Feed conversion ratio FCR, day 1-35

TID-45-19



ab superscripts mean that values are statistically different (p≤0.05)

Natupulse® TS shows an additional beneficial effect in combination with Natuphos® E and Natugrain® TS

Dose recommendation broiler/turkey: 100 g/mt of feed, containing high levels of soybean meal or other β-mannan containing feed ingredients.



Choose the Natupulse® TS formulations that are right for you

Product name	Form	Concentration	Dosage	Application	Shelf life	Article no
Natupulse® TS	Powder	8000 TMU*/g	800 TMU*/kg feed (= 100 g/mt feed)	Recommended for pelleting up to 90°C (194°F). Above 85°C (185°F), a test for mannanase retention is recommended	24 mo. (≤ 20°C)	50604289
Natupulse® TS L	Liquid	8000 TMU*/g	800 TMU*/kg feed (= 100 g/mt feed)	Recommended for post-pelleting liquid applications	24 mo. (≤ 20°C)	50613046

*TMU = Thermostable mannanase unit: is defined as the amount of enzyme that produces reducing carbohydrates having a reducing power corresponding to one µmol mannose from locust bean gum (0.3 g/100 ml buffer solution) in one minute under the assay conditions of 50.0 +/-0.1°C and pH 3.5.

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

Europe, Africa, West Asia

BASF SE
Animal Nutrition, Europe
Chemiestrasse 22
68623 Lampertheim
Germany
Phone: +49-62160-28073
Fax: +49-62160-28363
E-mail: animalnutrition-europe@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

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

¹Reviewed by Bach Knudsen (2014)

Reference: Bach Knudsen K.E. (2014): Fiber and nonstarch polysaccharide content and variation in common crops used in broiler diets. Poultry Science 93: 2380-2393.

²Reviewed by Choct et al. (2010)

Reference: Choct M., Dersjant-Lij, McLeish J. and Peisker M. (2010): Soy Oligosaccharides and Soluble Non-starch Polysaccharides: A Review of Digestion, Nutritive and Anti-nutritive Effects in Pigs and Poultry. Asian-Aust. J. Anim. Sci. 23: 1386-1398.

³Reviewed by Slominski (2011)

Slominski B. A. (2011): Recent advances in research on enzymes for poultry diets. Poultry Science 90: 2013-2023.

⁴Hsiao et al. (2006)

Reference: Hsiao H.-Y., Anderson D.M. and Dale N.M. (2006): Levels of β-Mannan in Soybean Meal. Poultry Science 85: 1430-1432.

⁵Reviewed by Shastak et al. (2015)

Shastak Y., Ader P., Feuerstein D., Ruehle R. and Matuschek M. (2015): β-Mannan and mannanase in poultry nutrition. World's Poultry Science Journal 71: 161-173.

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