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Technical Forum

IMPROVING NSP DIGESTIBILITY WITH ENZYMES

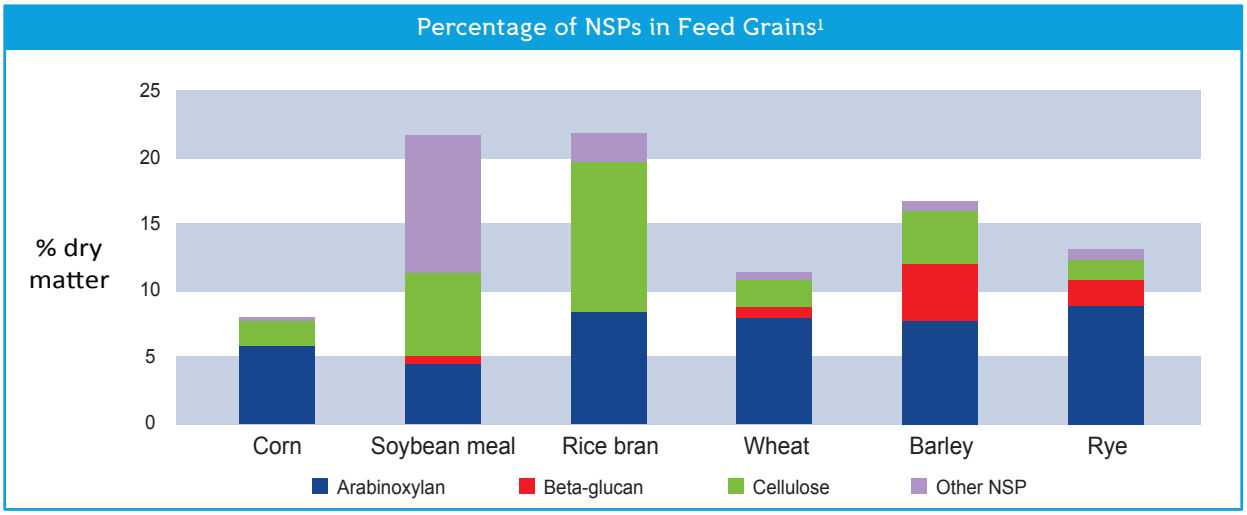
What Are NSPs and How Do They Impact Poultry Nutrition?

The primary ingredients in poultry feed are grains and grain by-products which provide the protein and energy necessary for proper animal nutrition and growth. Corn, wheat and soybean meal are the most widely used grains in poultry production. Each type of grain contains non-starch polysaccharides (NSPs) such as cellulose, arabinoxylan, beta-glucan, mannan and many more, all of which can be difficult for chickens to digest. Certain undigested NSPs increase the viscosity in the bird's digestive tract, reducing nutrient absorption, which in turn negatively impacts gut health, overall nutrition and growth.

Are There Significant Amounts of NSPs in Grains Used in Poulty Feed?

NSP content in feed grains can represent five to almost twenty-five percent of the total dry content of poultry feed, meaning that a significant portion of the feed is actually creating a negative impact on animal nutrition.

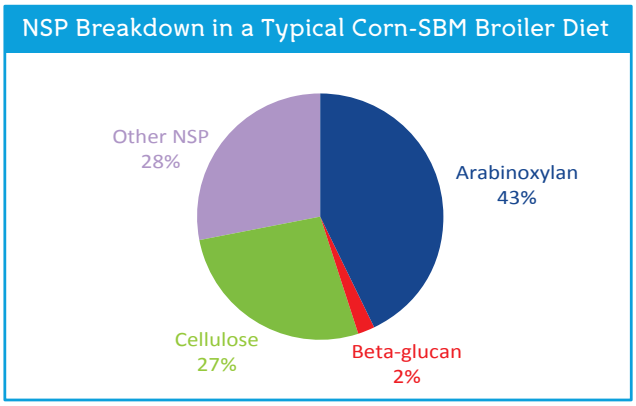
Each feed grain and grain by-product contains a unique mix of NSPs. The NSP content of corn, wheat, barley and rye is primarily arabinoxylan. Soybean meal, which is widely used in combination with corn and wheat, contains a more diversified mix of NSPs. Rice bran contains a significant percentage of both arabinoxylan and cellulose.



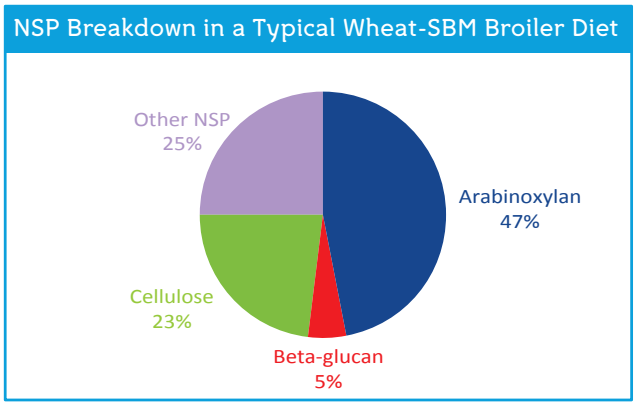
What is the NSP Breakdown in Typical Poultry Diets?

Improving digestibility of NSPs in poultry diets is one way in which producers can positively impact both feed efficiency and animal nutrition, but to do so requires an understanding of which NSPs are most prevalent in the particular diet being used.

In general, the largest amount of NSP content in typical poultry diets is arabinoxylan, approaching 50% of the total. The second highest NSP content is cellulose at approximately 25%. Beta-glucan is the third most prevalent type of NSP, representing up to 5% of the total.



In a typical broiler diet containing 60% corn and 30% soybean meal (SBM), arabinoxylan is dominant at 43%, followed by cellulose at 27%.



In a typical broiler diet containing 60% wheat and 30% soybean meal (SBM), arabinoxylan continues to dominate at 47%, followed by cellulose at 23%.

What Enzymes are Most Effective for Improving Digestibility of NSPs?

Because arabinoxylan is the most prevalent type of NSP in typical broiler diets (43% to 47%), inclusion of a high quality xylanase enzyme feed additive will release the greatest amount of encapsulated nutrients. A premium quality xylanase works by two mechanisms of action. First, breaking down components of the cell wall which releases encapsulated nutrients, and secondly, reducing digesta viscosity which increases digesta passage rate. The combination of these two mechanisms of action allows the bird's endogenous enzymes improved access to nutrients and reduces bacterial proliferation in the small intestine.

The second most prevalent NSP, cellulose (23% to 27%) is not a practical target for improvement in poultry as no enzyme system currently exists that would efficiently and cost-effectively fully release glucose from cellulose NSPs within the constraints of the bird's gastrointestinal tract[2].

The remaining approximately 25% of NSP content in typical broiler diets is made up of many different NSPs, each occurring in very small amounts (1% to 5%). Using specific enzymes to act upon each of the NSPs present in amounts under 5% may not be cost effective.

For the typical diets most widely used in poultry production, xylanase is by far the most efficient and cost-effective enzyme for improving NSP digestibility.

[1]Poultry Feedstuffs: Supply, Composition, and Nutritive Value edited by J. M. McNab, K. N. Boorman

[2]Dr Janet Remus, Annual Carolina Poultry Nutrition Conference, North Carolina, USA, Nov. 2008

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4222 Emperor Blvd, Suite 460 | Durham, NC USA 27703 | +1-919-993-3389 | sales@briworldwide.com | www.BRIworldwide.com