



### Why Use Xylanase?

Some of the NSPs typically present in grains and oilseeds are arabinoxylans and heteroxylans. Hence, there is potential for increasing dietary energy as well as improving digestion by supplementing xylanases in poultry diets.

Xylanase supplementation is often associated with diets based on wheat. This is largely because xylanases were first used with wheat-based poultry rations in Europe, as well as the fact that arabinoxylans make up a large portion of the NSP present in wheat.

	Carbohydrates	Corn	Barley	Wheat	Rye
<b>Total NSPs</b>		9.9	18.7	11.9	15.3
	<i>Arabinose</i>	2.2	2.8	2.9	3.6
<b>Arabinoxylans</b>	<i>Xylose</i>	3.0	5.6	4.7	6.1
	<i>Uronic acids</i>	0.7		0.4	0.4

	Carbohydrates	Soybean meal	Rapeseed meal	Sunflower meal
<b>Total NSPs</b>		21.9	22.2	31.5
	<i>Arabinose</i>	2.6	4.3	3.1
<b>Arabinoxylans</b>	<i>Xylose</i>	1.9	1.7	5.1
	<i>Uronic acid</i>	4.8	6.1	6.7

Bach-Knudsen, Knud Erik, 1997. Carbohydrate and lignin content of plant materials used in animal feeding. Anim. Feed Sci. Tech. 67: 319 - 338.

Xylanases, however, also have potential benefits in corn- and soybean meal-based rations. Corn typically contains about 9.9% NSP on a dry matter basis, of which approximately 6% is made up of arabinoxylans (see previous page).

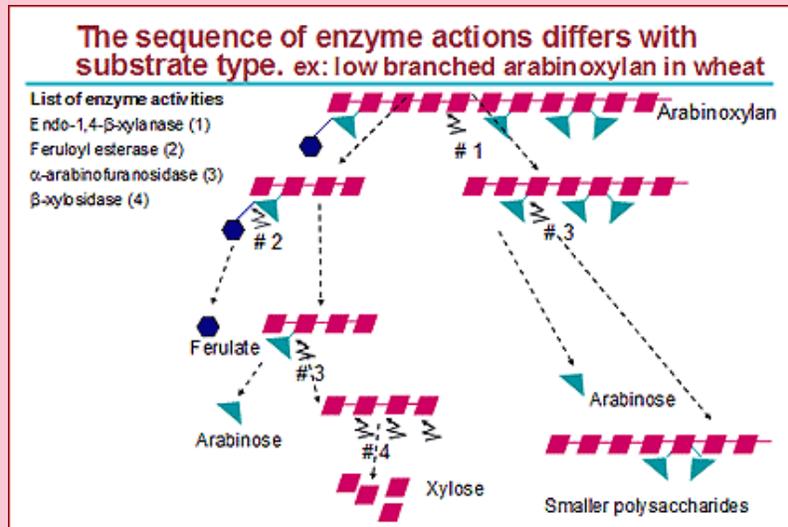
Soybean meal contains approximately 22% NSP, of which about 9% is made up of arabinoxylans.

Thus, the potential exists for xylanases to free energy from the NSP contained in corn- and soybean meal-based rations.

## Why Use Xylanase? (cont'd)

One important consideration to remember regarding all enzymes is that they react with a specific substrate (and xylanases are no exception). As such, xylanases differ, and cannot be compared quantitatively from product to product. For instance, below it can be seen that an arabinoxylan typically requires four specific xylanase activities to be broken down to a simple sugar.

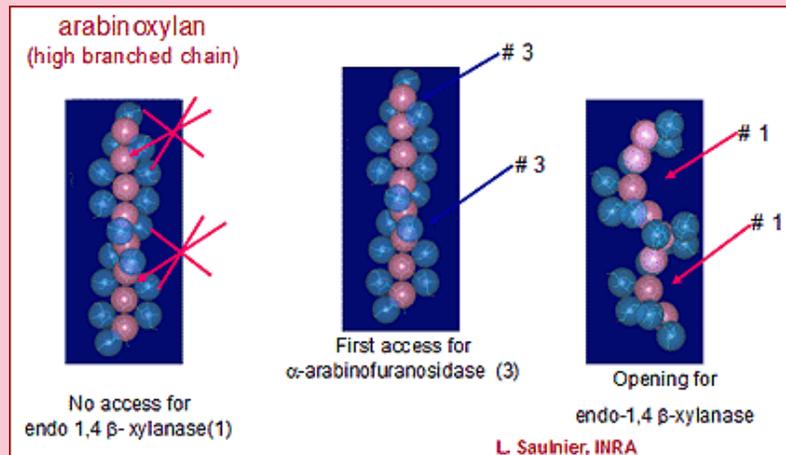
For different arabinoxylans, however (such as the highly-branched arabinoxylans found in corn), a different sequence of xylanase activity is required to effectively break down the NSP (see next page).



The complex structure of various NSPs requires the action of different enzymes with specific activities to be broken down.

For instance, in this example, the enzymes necessary to break a typical wheat arabinoxylan can be seen. Endo- 1,4- $\beta$ -xylanase (1) cleaves the endo-1,4- $\beta$  linkages between the individual monomers of xylose. In addition to xylose sugars, arabinoxylans contain additional carbohydrate substitutions or "branches" comprised of either arabinofuranose or ferulic acid. For these branches to be cleaved from xylose, the activities of  $\alpha$ -arabinofuranosidase (3) and feruloyl esterase (2) are required.

## Why Use Xylanase? (cont'd)



In some cases, as seen in this example of a highly substituted arabinoxylan, typical of corn, access to endo-1,4- $\beta$  linkages is impeded by the presence of arabinofuranose. Therefore  $\alpha$ -arabinofuranosidase (3) activity is required to allow Endo-1,4- $\beta$ -xylanase (1) access to its target substrate.

Therefore, enzyme products which contain multiple xylanase activities should have higher potential for improving digestibility over a broader range of feedstuffs.

As arabinoxylans represent a large portion of the NSP present in most cereal grains and oilseeds, it is evident why so many commercial carbohydrase enzymes seek to express xylanase activity.