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ENZYME UPGRADE FOR WET-FEED PRODUCTS

by Vesa J. Nissinen

Results from experimental studies and practical experience are confirming the handling advantages obtainable from adding enzymes to low-cost food industry by-products for use in the liquid feeding of pigs.

Besides being frequently cheaper than conventional dry feed ingredients, these by-products can be rich in highly digestible energy and/or protein. A guide to the composition and potential feeding value of 4 such materials is given in Table 1.

Potato steam peelings, containing the peel material and varying levels of partially hydrolysed starch, are obtained from a steam process used for example in the production of potato chips for humans. Wheat starch and gluten production by wet milling creates substantial amounts of high-starch and protein-rich effluents which can be fed in their raw state, as part of a mixture or after further processing such as drying. The slaughterhouse product indicated is an acidified material resulting from the extraction of fat from offal of mixed origin.

As can be seen from the Table, a feature of many by-products is that they have a low drymatter content. In practice, therefore, they are mainly suitable for application through a liquid feeding system.

Other limitations may include fluctuating supplies according to the season of the year and varying chemical

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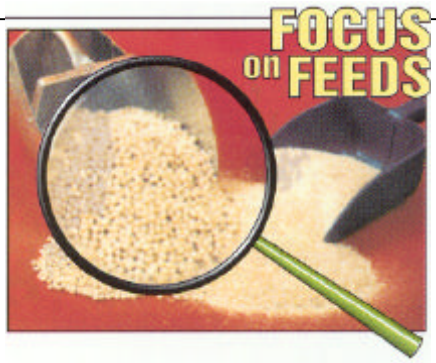

composition, but one aspect, which many have in common, is a high viscosity. Their rather thick and sticky consistency makes them difficult to pump. Fortunately, the high amount of water present in a typical by-product provides an excellent environment for enzymes to act effectively. Their action not only overcomes viscosity problems, but also destroys components which are known anti-nutritional factors.

The viscosity of the by-products is caused by different components in each case. Consequently, specific enzyme systems have to be developed and used to alleviate the handling problem. In the case of potato steam peelings, the viscosity is due to partly solubilised pectin and starch. The addition of a specially designed enzyme product has been shown to reduce the relative viscosity of 15% drymatter peelings by half (Figure 1). When the effects on the flow characteristics of the material were evaluated by what is called a funnel test, adding the enzyme reduced viscosity and kept it down even at lower temperatures. Under practical conditions this would mean the by-product was easier to pump, while its better flow properties allowed higher levels to be included in liquid feeds for pigs. Using a material which flows more easily also results in cleaner storage tanks and pipes so that overall feeding hygiene is improved. With an appropriate supplementation of sulphur amino acids, the successful use of the peelings to provide 25-30% of the liquid feed drymatter has been reported.

The main cause of viscosity in wet-milled wheat by-products are soluble fibre fractions known as arabinoxylans, but research has shown how they are hydrolysed by a specific enzyme product to obtain improved handling properties. A substantial reduction in viscosity was achieved with both starch-rich and protein-rich wheat products.

A problem with slaughterhouse offals is that they easily become extremely solid as they cool. This is due mainly to the presence of gelatinised protein. When a suitable enzyme product has been tried on pure gelatin, however, a partial hydrolysis of the protein was demonstrated which in practice prevents the gelling of the acidified offal without excessive structural damage to the by-product. In this way the separation of drymatter and liquid in transport and storage is avoided, providing a material which is successfully included in liquid feeds as a good source of protein and energy.

Each of the by-products featured here is an interesting potential candidate for liquid feeding. There are various nutritional aspects involved in their use, for example the fact that their potassium content may be high and the frequent need to supplement them with higher levels of essential nutrients such as amino acids in the final feed. But the major obstacle of viscosity, which can make handling difficult and sometimes impossible within liquid feeding systems, can be removed by upgrading the products with suitable enzymes.

TABLE1: Composition of 4 by-products used in liquid feeding.

	Potato steam peelings	Starch rich wheat by-product	Protein rich wheat by-product	Slaughter-house by-product
Average drymatter (%)	13.5	31	10	18
- digestibility (%)	88	-	-	-
Energy (MJ/kg DM)	14.5	16.8	16.8	13.0
- digestibility (%)	86	100	100	-
Crude protein (% DM)	14	5.0	23	25
- digestibility (%)	76	-	-	-
Crude fibre (% DM)	0.5	0.3	2.0	-
- digestibility (%)	64	-	-	-
Starch (%)	39	25.3	-	-
Phosphorus (g/kg DM)	2.8	6.5	4.3	3.0
Lysine (g/kg DM)	7	1.3	11	17
Cystine (g/kg DM)	3.6	1.3	4.6	1.1
Methionine (g/kg DM)	3.0	0.6	6.4	6.4
Threonine (g/kg DM)	4.9	1.3	8.6	-
Potassium (g/kg DM)	35	6.8	4.3	16
Sodium (g/kg DM)	0.1	4.2	2.6	10

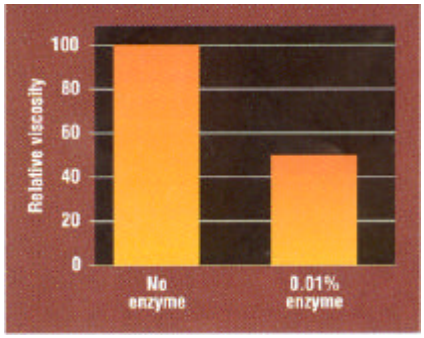

FIGURE 1: Effect of an enzyme product (Heptex-pp) on the viscosity of potato steam peelings (incubation for 30 minutes at 55ºC.)

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