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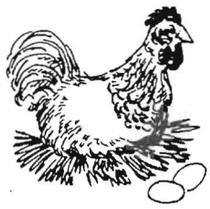

COMMERCIAL EGG TIP . . .

ENZYMES, SUBSTRATES, AND END PRODUCTS

Over the past decade, the use of enzymes in poultry feeds has received considerable attention. In Canada, parts of Europe, and certain other areas of the world where wheat and barley are common ingredients, the addition of enzymes to improve nutrient utilization has long been routine. In the United States, the enzyme which has received the most attention has been *phytase,* a product used to improve the utilization of the phosphorus in feed ingredients of vegetable origin.

In order for the use of enzymes to be economically (and environmentally) justifiable, attention must be given to two basic considerations: 1) is adequate substrate (target substance) available in the feed for the specific enzyme being used, and 2) will the end products of enzyme activity be effectively utilized by the animal.

The enzymes *xylanase* and *beta-glucanse* are widely used for diets containing wheat and barley, respectively, because there are substantial amounts of xylans and beta-glucans in these grains. By contrast, the levels of these carbohydrates in corn and sorghum are much lower. Thus, there has been very limited use of the wheat/barley type enzyme products in the corn/soy sorghum/soy diets popular in the United States, Brazil, and many other countries. In these cases, condition #1 (adequate dietary substrate) has not been met.

In other cases, if we have determined that there is adequate substrate for a specific enzyme, the second question is how effectively the animal can utilize the end products of enzyme digestion. Obviously, if the use of an enzyme produces an excess of a given nutrient, its economic value will be negligible. An example of this possibility is noted in the following table.

	CORN/SOY DIET (%)	CORN/SOY/MEAT & BONE DIET (%)
Corn	60	60
Soybean meal	26	20
Meat and bone meal*	0	6
CALCULATED ANALYSIS		
Crude protein	16.7	16.7
Total phosphorus	0.30	0.58
Phytate phosphorus**	0.20	0.18
Available phosphorus	0.10	0.40
*5% phosphorus; **The largely indigestible fraction of phosphorus found in plant material.		

In the table, we see approximate levels of several ingredients in layer formulations with and without 6% meat & bone meal. In addition to crude protein, levels of total phosphorus, phytate phosphorus, and available phosphorus have been calculated, bearing in mind that plant phosphorus (largely phytate phosphorus) is only about 1/3 available to monogastric animals. By adding meat and bone meal, the amount of total phosphorus almost doubled, but the percent phytate phosphorus drops only slightly, from 0.20 to 0.18%. Thus, adequate substrate remains if the producer elects to employ a *phytase* enzyme in the feed containing meat and bone meal. However, as is well known, the phosphorus in meat and bone meal is almost completely available. For purposes of the example, a content of 5% phosphorus was assumed for the meat and bone meal. We note that the feed with meat and bone meal contains 0.40% available phosphorus, which is adequate to meet the generally accepted requirement for this nutrient in laying hen feeds. Thus, there is no purpose in utilizing *phytase* in this scenario, not because of a lack of substrate but rather because the end product of enzyme supplementation (increased available phosphorus) is not needed by the animal. As phosphorus in excess of the requirement is voided in the manure, neither is there an environmental reason for employing *phytase* in this case. In the diet based only on corn and soy, as the level of available phosphorus is well below the requirement, both conditions for the use of an enzyme (in this case *phytase*) would be satisfactorilly met (adequate substrate + need for end product).

The use of enzymes in poultry feeds will likely expand as progress is made in developing products which enhance the bird's ability to digest nutrients in the feed. However, each enzyme or enzyme product will have to be evaluated to ensure there is adequate substrate in the feed to justify its use, and that the end products of digestion will be of value to the animal.

Nicholas M. Dale
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Consult with your poultry company representative before making management changes.