Optimising the utilisation rate of diversified diets with feed enzymes

In recent years, many factors – such as the Covid-19 pandemic, intensified geopolitical conflicts, ongoing trade disputes, and frequent extreme climate disasters – have led to increasing uncertainty in the international grain market.

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This has resulted in supply shortages, unstable markets and soaring prices of bulk feed raw materials such as corn and soybeans. The continuous rise in feed raw material prices has triggered a wave of finished feed price increases, resulting in high breeding costs.

This has also put enormous pressure on poultry producers. Therefore, 'cost decreasing and benefit increasing' has become a fundamental need for the survival of large poultry farming companies and feed companies.

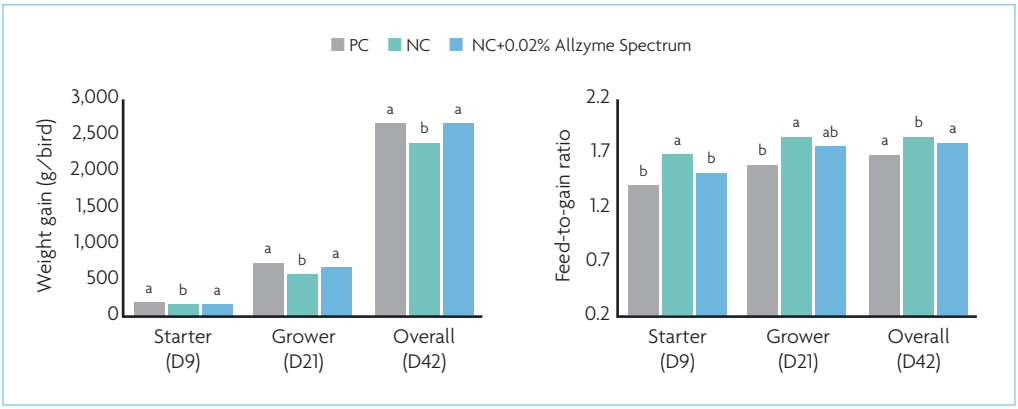

Fig. 1. Effects of Allzyme Spectrum on the performance of broiler chickens.

In order to effectively cope with the rising prices of feed raw materials, many producers from different countries are actively looking for lower-priced alternatives, such as alternative grains, alternative meals, agricultural byproducts and food industry byproducts, to reduce production costs and increase profit margins.

Use of alternative raw materials

Alternative raw materials have a wide range of sources, but the composition is relatively complex. The disadvantages of these alternative feed ingredients limit their efficient utilisation in feed production.

Table 1. Relative NSPs contents (%) in different feed ingredients.

Raw materials	Cellulose	Xylan	Lignin	Pectin	α-galactoside	β-glucan	β-mannan	Total NSP	Insoluble NSP	Soluble NSP
Maize	1.7	4.4	0.5	0.1	–	0.1	0.60	8.1	8	0.1
Wheat	2.4	8.0	0.7	0.2	0.7	0.7	–	11.40	9.0	2.4
Sorghum	2.1	4.5	1.1	0.2	–	0.7	0.1	4.8	4.6	0.2
Barley	3.9	5.7	2.0	0.6	0.7	10.5	0.2	16.7	12.2	4.5
Wheat bran	6.8	21.9	3.0	1.8	–	14.0	3.4	33.4	31.9	1.5
Rice bran	10.0	10.0	3.9	0.4	–	10.0	1.2	23.0	18.3	4.7
Wheat middlings	5.8	14.0	4.2	0.2	–	20.0	0.2	22.4	18.7	3.7
Soybean meal	10.3	6.0	1.6	9.5	6.0	1.4	2.0	19.2	16.5	2.7
Rapeseed meal	10.0	4.0	11.0	6.8	2.9	0.5	1.1	46.1	34.8	11.3
Cottonseed meal	12	7.8	3.4	3.0	3.8	0.2	1.4	24.9	13.2	11.7
Palm kernel meal	18.8	–	–	–	–	–	25-30	40-50	–	6-7
DDGs	3.5	14.7	4.3	0.1	–	0.3	0.3	27.1	13.6	13.5

The main problems are as follows:

- Compared with conventional raw materials, the nutritional value is low, and the nutritional composition is unbalanced.
- Most of them contain a variety of anti-nutritional factors or toxicants, cannot be used directly without treatment, or must be limited in the amount used.
- They may have poor palatability and low feeding values.
- Due to the influence of many factors, such as origin, processing, and batch and storage conditions, the nutritional composition varies greatly, and the quality is also unstable.
- A lack of research data can affect the application of alternative feed ingredients and also increases the overall difficulty of formulation design.

Therefore, in order to rationally use alternative feed ingredients, we must do the following:

- Know their nutritional values and the factors that affect those values, and formulate appropriate procurement standards.
- Pay attention to the nutritional balance, as alternatives usually contain more essential amino acids than conventional ingredients.
- Understand the composition and content of anti-nutritional factors, and determine the appropriate use ratio in feed formula.

Unconventional feed ingredients usually contain higher anti-nutritional factors, such as

non-starch polysaccharides (NSPs) (Table 1).

NSPs, including cellulose, xylan, β-glucose, β-mannan and pectin, have high water-holding capacity that can affect digesta viscosity in poultry.

High-digesta viscosity produced as a result of NSPs delays gastric emptying and feed transit time and decreases interaction of the intestinal enzymes with feed macromolecules, resulting in decreased nutrient availability. Eventually, this leads to decreased growth performance.

Also, there is an inverse relationship between the content of NSPs in the feed and its nutritional value.

A large number of studies have confirmed that exogenous enzymes can eliminate anti-nutrient factors in feed, reduce the impact of indigestible parts in feed, improve the digestibility and utilisation of feed nutrients, and improve the overall utilisation value of unconventional feed raw materials.

A unique feed enzyme technology

The composition of a large amount of NSPs in alternative feeds is complex and requires a variety of enzyme preparations.

Also, the source and quality of feed enzymes vary, so their effects are not always the same, thus, the selection of a stable and good-quality multi-enzyme supplement is crucial to the full use of unconventional feed in the diet.

Allzyme Spectrum is a next-generation multi-enzyme complex that maximises nutrient utilisation by breaking down substrates commonly found in poultry diets, such as NSPs and phytate.

This provides greater flexibility for reformulation and enhances the use of alternative raw materials, resulting in increased cost savings, more efficient feed utilisation and less nutrient release into the environment.

	Weight gain (g/bird)	Feed intake (g/bird)	Feed-to-gain ratio
PC	789.8[a]	1172.6[a]	0.673[a]
NC	638.0[b]	1051.6[b]	0.606[b]
NC+150g/t Allzyme Spectrum	772.2[a]	1179.2[a]	0.656[a]
NC+200g/t Allzyme Spectrum	761.2[a]	1148.4[a]	0.660[a]
NC+250g/t Allzyme Spectrum	765.6[a]	1168.2[a]	0.656[a]

Table 2. Effects of Allzyme Spectrum on the performance of broilers.

Research-proven results of multi-enzyme complexes

Broiler and layer research trials from universities and commercial institutions have demonstrated the benefits of including Allzyme Spectrum in poultry diets.

A recent study from the Alltech–University of Kentucky Nutrition Research Alliance investigated the effect of Allzyme Spectrum on the growth performance of broiler chickens fed a low-nutrient diet for a 42-day period (Fig. 1).

Some 528 one-day-old male Cobb 500 broiler chicks were distributed in a completely randomised design, with three types of experimental corn-soy based diets:

- Positive control (PC) with commercial nutrient level.
- Negative control (NC) with a reduction nutrient level (90kcal/kg less ME and 0.15% less Ca and avP relative to the PC diet).
- NC plus a commercial enzyme (0.02% Allzyme Spectrum).

The results showed that weight gain and feed conversion were significantly reduced when chickens were fed with the low-nutrient diet during each phase and overall growing period.

However, the inclusion of Allzyme Spectrum in a diet with reduced ME, Ca and avP resulted in higher weight gain and feed conversion of broilers, such that their performance was equal to the commercial reference diet. Bauer et al. (2022) studied the effect of Allzyme Spectrum supplementation on the performance and viscosity of jejunal digesta of broiler chickens fed low nutrient wheat-soybean meal-based diets (Fig. 2, Table 2).

Some 300 1-day-old male Cobb500 broiler chicks were distributed in a completely randomised design, with five dietary groups:

- Positive control (PC) with a nutrient level equivalent to commercial level.
- Negative control (NC) with a reduction nutrient level (90kcal/kg less ME and 0.15% less Ca and available P compared to the PC diet).
- NC+0.015% Allzyme Spectrum.
- NC+0.02% Allzyme Spectrum.
- NC+0.025% Allzyme Spectrum.

The results indicated that supplementation of Allzyme Spectrum in a wheat-SBM-based diet reduced the viscosity of jejunum digesta in the broiler.

When chickens were fed a wheat-SBM-based NC diet with low nutrient density, the weight gain, feed intake and gain-to-feed ratio of broilers were significantly decreased compared to those broilers fed a PC diet. The inclusion of Allzyme Spectrum to the NC diet increased feed intake, weight gain and gain-to-feed ratio compared to those broilers fed an NC diet, and the broiler performance in Allzyme Spectrum treatment groups was similar to that in the PC group.

A layer study from Ao et al. (2022) evaluated the effect of a low-nutrient corn-soy diet and enzyme supplement on the production performance and eggshell quality of laying hens for a 44-week period. 144 Hy-Line brown layers at 16 weeks of age were distributed in four treatment groups:

- Positive control (PC) with commercial nutrient level.
- Low Ca and avP diet (0.15% less Ca and avP compared to PC)+ commercial phytase (250 FTU/kg).
- Low Ca and avP diet (0.15% less Ca and avP compared to PC)+0.02% Allzyme Spectrum.
- Low ME, Ca and avP diet (90kcal/kg less ME and 0.15% less Ca and avP compared to PC)+0.02% Allzyme Spectrum.

The results showed that the hen-day egg production, feed intake and feed conversion ratio were not different between the enzyme treatment groups and positive control group, despite the fact that the nutrient level in enzyme supplementation diets was lower than in the PC diet.

The trial also indicated that the egg quality parameters (egg weight, eggshell breaking strength and eggshell percentage) were similar to the positive control when layers were fed diets containing reduced levels of nutrients with enzymes.

With the costs of feed raw materials still rising sharply, and with unpredictable market conditions and increasing challenges and pressure across the poultry industry, the use of alternative feed raw materials to formulate a diversified diet formula has become the choice of more producers in the industry.

Feed enzymes, as a functional additive, have been widely recognised for their role and effect and have become an indispensable additive in feed. Alltech is a leader in innovative enzyme solutions, and its unique multi-enzyme complex, Allzyme Spectrum, with its good synergy and efficiency, is an ideal choice for poultry producers. ■

Fig. 2. Effects of Allzyme Spectrum on jejunal viscosity.

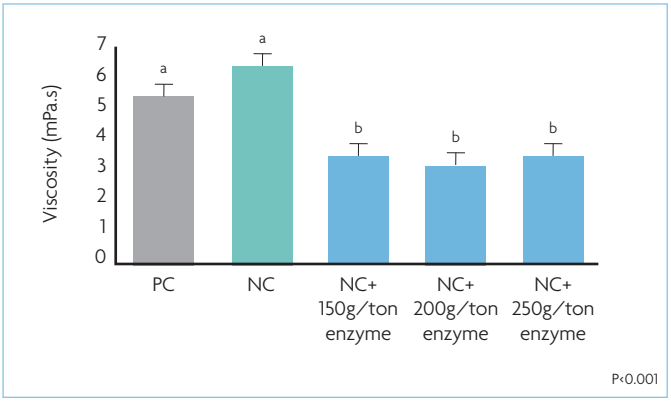

Fig. 3. Effects of Allzyme Spectrum on the eggshell quality of layers.