VTPro – The Newest Protease for Animal Nutrition from VTR Bio-Tech

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Protein Digestibility

Protein is a critical part of the diet and hence, of the animal overall growth rate. This also relates to performance, both productive and financial.

Chickens are ontogenically capable of digesting protein since day one of their life, so pre-starter diets are rich in vegetable protein, often above 21% crude protein.

In production conditions, however, there may be times when overall protein digestibility diminishes. This is a complicated situation because it will not only impact the growth rate of the chicken, but it may have serious consequences for the digestive and microbial metabolism, causing a deeper depression of growth.

Protein digestibility depends on the right amount of hydrochloric acid and pepsinogen being secreted in the proventriculus; protein is broken down to peptides that are further down the gut split into amino acids. When these secretions are reduced, or the protein has reduced solubility, partially degraded protein may pass to the duodenum and beyond, causing microbiota disturbances, deviated digestion, enterotoxin production, and biogenic amines release, resulting in performance loss.

VTPro – Aspartic Protease

A protease added to the diet that may improve digestion in the anterior segments of the gastrointestinal tract would be an interesting tool. However, the local pH conditions may limit protease activity. Serine proteases, the enzyme type most currently used, is an alkaline protease. Its optimum activation pH of 7.5 is too high to modify protein digestion there.

VTpro is an aspartic protease. It has optimum activity at pH 3.0 to 4.0, so it is fully active all the time feed stays in crop, proventriculus and gizzard. Feed remains in these there cavities almost 50% of all transit time in chickens, so there is ample time for VTpro to act upon the protein content of the diet.

As VTPro maintain up to 50% of its efficacy at pH lower than 6.0, it complements trypsin activity. Research has shown that the combination of VTpro and trypsin at pH 5.5 increases feed protein solubility by 44%.

Ileal digestibility orientates the chicken's digestive efficiency for a specific nutrient: For proteases we are basically interested in protein digestibility. Tests performed with VTPro at a dose range of 80 to 120 ppm in broiler chickens, demonstrated that the digestibility of crude protein increased up to 3.72%. Additionally, modest increases in dry matter and metabolizable energy digestibilities were also recorded. Thus, VTPro helps chickens better digesting the vegetable protein component of their diets.

A secondary benefit is the higher the protein digestibility, the less nitrogen is excreted to the environment. Nitrogen pollution is a severe problem that contributed to land contamination and aquifer eutrophication. Improving protein digestibility reduces N excretion and contributes to a greener, environmentally friendlier chicken production.

Animal Experimentation

It is always interesting to test the limits of any product's activity, and see up to what point we can extend its activity. For VTPro we did exactly that, twice.

In an FCR-focused experiment, at a Brazilian university we created two amino acid deficient chicken diets, by 3% and 6%, and a protein and amino acid compliant control. We added 100 ppm VTPro to the -6% diet and recorded whether the chickens had feed efficiency similar to the -3% diet. The amino acid compliant diet served as marker for the correct development of the birds.

For FCR, the -6% diet with VTPro had the same value than the -3% diet. This means, VTPro was able to compensate 3% essential amino acids and protein from the -6% diet, and approach its performance to the -3% diet. Table 1 has the data for this essay.

Table 1. FCR performance in experiment 1

Diet	FCR
Positive control	1,650
Negative control 1, -3 % essential AA	**1,680**
Negative control 2, -6 % essential AA	1,730
VTPro diet (100 ppm)	**1,678**

The second experiment was run in 2019 in collaboration with the UDCA University and Tekzol SAS in Colombia. It was a full growth trial with Cobb chickens, from 1 to 42 days of age, with very similar setup. An amino acid compliant diet as internal control, and two deficient diets, -3% and -6% essential amino acids. VTpro was added to the -6% diet at 50, 100, and 150 ppm from day one, and in each one of the three phases the experimentation was divided into.

Table 2. Chicken performance in experiment 2

	Wk	PC	-3%	-6%	VTP100
Body weight, g	1	180	175	165	173
	2	457	424	404	431
	3	956	900	860	908
	4	1601	1525	1463	1513
	5	2269	2184	2056	2196
	6	2914	2788	2630	2787
Feed Conversion Ratio	1	0,850	0,857	0,933	0,867
	2	1,133	1,205	1,290	1,193
	3	1,205	1,273	1,340	1,258
	4	1,337	1,386	1,439	1,393
	5	1,439	1,426	1,536	1,432
	6	1,574	1,567	1,661	1,558

The data in Table 2 shows very clearly that the results of the experimentation were very positive. Both FCR and end weight of VTPro added to -6% diet at 100 ppm, were identical to the -3% diet. VTpro effectively compensated that much amino acids and crude protein.

Messages to Take Home

VTPro is an aspartic protease that increases protein digestibility, acting on feed already from the moment of ingestion, in the acidic segments of the intestine.

VTpro has been shown to increase protein digestibility in controlled trials.

And VTPro has also shown that it can help reducing the total amount of amino acids and crude protein up to 3% in broiler chicken diets. This has the benefit of increasing the financial performance of growing chickens while protecting the environment, as less nitrogen is excreted and pollution levels decrease.

Contact VTR at vtr@vtrbio.com or visit http://intl.yiduoli.com/en/ for additional information on this one and other available enzymes that can help you being more efficient.