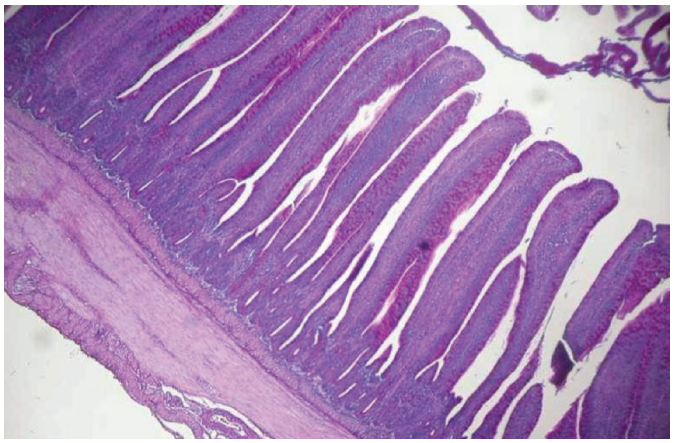
Phytogenics boost layer production to feed future generations

by Luca Vandi, Poultry Technical Manager, Carina Schieder, Product Manager Phytogenics, Biomin Holding GmbH, Herzogenburg, Austria.

In 2050, nine billion people need to be nourished worldwide. Planet Earth is a limited system in terms of natural resources, for example arable land. So the challenge is to get more food from the same limited system.

The answer: greater efficiency. Efficiency must consider all the stages in the food production chain.



Under the microscope: a close up of intestinal villi shows how phytogenics affect gut morphology.

Laying hens

Take laying hens, for instance. Genetic companies are focused on continuously improving the laying efficiency.

In 1998, a layer was able to lay 310 eggs in 72 weeks. Today it is 320 eggs in the same period.

Feed is another key factor for layers' efficiency. Since feed represents between 60-70% of the total cost of egg production, a lot of attention is paid to improving feed efficiency.

As an example, the use of non-starch polysaccharide enzymes as well as exogenous phytase in layer diets helps to reduce problems related to anti-nutritional factors present in some raw materials, thus contributing to improving the feed efficiency.

Get the most out of feed

The battle against anti-nutritional factors is just part of the strategy to improve feed efficiency in layers.

Another strategy is to increase the digestibility of feed in the gut and increase the gut's absorption of nutrients, while reducing gut inflammation.

Selected phytogenic feed additives are capable of supporting gut performance in these ways.

Phytogenics have traditionally been used as flavours and spices in human nutrition and medicine or even for food preservation.

The incredible biodiversity of the plant kingdom provides a large variety of different herbs and spices with an enormous number of active substances exerting different effects in the organism – ranging from stimulating endogenous enzyme secretion over influencing gut microbiota to enhancing gut protection.

Their mechanism of action depends on the chemical structure of the active substances or constituents. Spices, herbs, essential oils or extracts exert different effects.

For example, phenols such as thymol, carvacrol and eugenol (often derived from thyme, oregano and clove) and their methyl ethers have a very strong antiseptic effect.

Species of the families of Apiaceae such as caraway and fennel and Lamiaceae (for example rosemary and peppermint) have strong anti-oxidative properties.

Other plant compounds support better digestibility by boosting digestive secretions such as bile, mucus and saliva as well as enhancing enzyme activity.

Constant and reliable results in animals, however, can only be achieved with a well defined formulation of a phytogenic blend, including standardised raw material with continuous quality control.

Gut performance

A study conducted at a research facility in France confirmed the positive effects of a precisely formulated phytogenic feed additive (Digestarom, Biomin Holding GmbH, Austria) on intestinal enzyme activity.

Continued on page 9

Fig. 1. Anti-inflammatory effect of Digestarom (*significant difference vs. positive control; p<0.05).

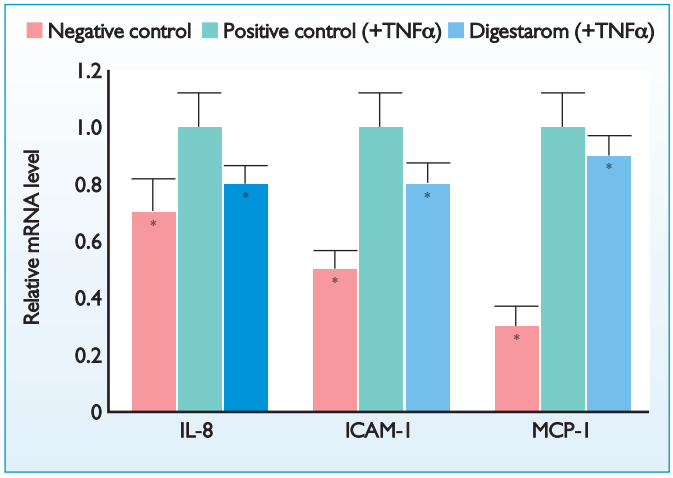
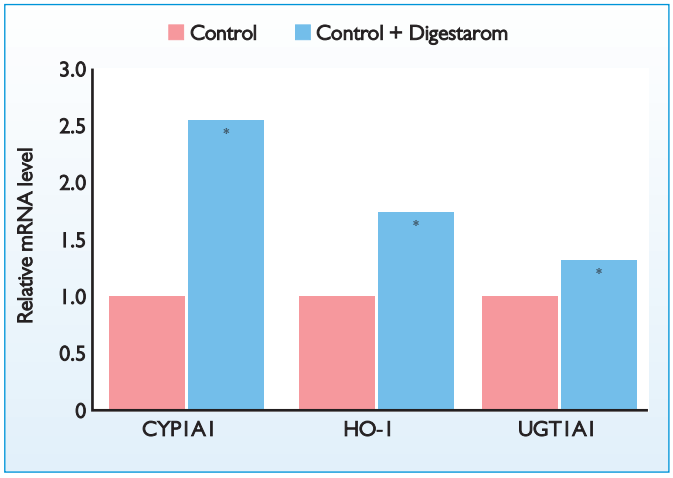


Fig. 2. Antioxidative effect of Digestarom (*significant difference vs. positive control; p<0.05).



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In the study enzymes involved in sucrose, disaccharide maltose and amino acid breakdown (maltase, sucrase and aminopeptidase, respectively) showed increased activity (+26.2 to 27.5%) in broilers. Higher enzyme activity correlates with a greater digestibility of nutrients.

Furthermore, the phytogenic feed additive (Digestarom) has also proven its positive effects on the intestinal morphology in a study conducted at Purdue University.

Villi length was increased by 11.9% in challenged birds receiving the phytogenic feed additive compared to challenged control birds. Increased villi length is positively reflected in more differentiated cells and an increased capacity for nutrient absorption.

Moreover, inflammatory processes and decreased gut protection, respectively, in the intestinal tract resulting from infections or feed-dependent changes negatively affect animal health and animal performance. Inflammation is a costly process since it often involves anorexia.

Moreover more energy, derived from the feed, needs to be utilised for defeating inflammatory processes.

Hence inflammatory processes together with a decreased antioxidant status are inversely related to performance (growth rates, laying performance, etc) and associated with higher morbidity and mortality. The anti-inflammatory effects of phytogenic compounds were elucidated in a number of studies.

	Control	Digestarom
Trial period (d)	70	70
Laying rate (%)	85.96	87.50
Egg weight (g)	65.9	66.6
Egg numbers (n/hen housed)	60.2	61.3
Egg mass (kg/hen housed)	3.97	4.08
Mortality (%)	2.84	2.75
Feed intake (g/d/hen housed)	109.7	107.6
Feed conversion ratio	1.94	1.85

Table 1. Effect of Digestarom on performance parameters.

The direct anti-inflammatory activity of the phytogenic feed additive (Digestarom) was shown in a test model with inflammation-induced intestinal cells (Fig. 1).

The experiment revealed inhibitory effects on indicators (target genes) of inflammatory response, hence leading to down regulation of the NF-κB pathway.

Moreover, the phytogenic feed additive showed an up-regulation of genes involved in the Nrf-2 pathway, which is one of the major cellular defence mechanisms. These tests demonstrate that the phytogenic additive supports the protection of intestinal tissue (see Fig. 2).

Intestinal health

Digestibility, gut morphology and protection are closely connected to each other in the layer's body. All of them have the same target: optimising the feed consumption, minimising losses due to poor digestion or intestinal disorders and maximising the performance.

If this approach is interesting in standard performing conditions, the practical application becomes a must in low performing flocks.

In a recent field trial with a flock of H&N white layers, low performing due to an NDV outbreak at the beginning of the laying cycle, the addition of a phytogenic product in the feed increased laying rate by 1.8%, egg weight by 1.1% and improved feed conversion by 4.6% (Table 1).

The positive trial results produced an economic benefit with a net return on investment of 6:1.

Conclusion

Future population growth and limited resources will be key drivers for looking at solutions to improve efficiency in animal production.

In the animal, impaired feed conversion, resulting from poor digestion and intestinal imbalances, leads to a cascade of problems resulting in decreased performance.

The significant influence of precisely formulated phytogenic feed additives on gut performance via increased enzyme secretion, improved gut protection and positively influenced gut morphology contributes to improvement in digestibility and feed efficiency for poultry. ■

References are available from the author on request