Phytogenics – be one step ahead with plant derived feed additives

When it comes to feed additives (plant extracts, enzymes, pro- and prebiotics, organic acids and many more), the livestock industry is inundated with numerous options, not only promoting performance of the animals and improving profitability, but also improving the quality of feed and of animal-derived products.

In this context, phytogenic (plant derived) feed additives are predicted to have a promising future in animal nutrition due to their broad range of efficacies, and to their effects on sustainability and safety.

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Increasing upcoming resistance of bacteria, arising from continuously supplemented sub-therapeutic levels of antibiotic growth promoters in livestock feeding caused the European Union to ultimately impose a ban on the use of antibiotics in animal nutrition in 2006, with other countries worldwide following suit. At the start of 2017, a ban on antibiotic growth promoters will also become effective in the US. Consequently, alternative feed additives are receiving increased attention among scientists, nutritionists, feed manufacturers and farmers.

Proven for centuries

The use of plants and their compounds has a long history in human nutrition and medicine, being used as flavours, food preservatives and medicinal plants.

Phytogenic feed additives (PFAs) comprise a wide range of plants, like herbs, spices and plant-derived essential oils (hydro-distilled extracts of volatile plant compounds, mainly hydrocarbons, containing most of the active substances of the plant) and oleoresins (extracts based on non-aqueous solvents). The chemical composition of PFAs underlies a certain variation due to their ingredients and other influencing factors like climate, location, harvest, stage and storage conditions, explaining the differences in efficacy between PFAs that are available on the market so far.

However, it should be realised that not all PFAs available on the market are standardised on major actives and/or based on all-natural plant ingredients, but might also contain synthetic nature-identical components.

The 'scientific gold standard' in the feed industry

Phytogenics show a wider range of activities in animal nutrition than synthetic substances.

This advantage is based on the synergistic effects of all agents within plants. This natural synergy, grouped with sustainability and safety, is what makes phytogenics a top solution platform in animal nutrition.

Fully based on phytogenic components and not on nature-identical, single active ingredients, to date, only one such plant-derived feed additive has received zootechnical registration by the European Union, Fresta F.

This is seen as the scientific 'gold standard' in the feed industry, because in the course of strict approval processes, not only the safety but also the performance enhancing effects as 'natural growth promoter' of the product have been officially confirmed by the European Food Safety Authority (EFSA).

PFAs show a wide range of potential benefits, all targeting the enhancement of performance of livestock. The following gives an overview of proven benefits:

- **Increased enzymatic activity in the intestinal tract**

Numerous herbs and spices are shown to increase pancreatic enzyme production and bile secretion in the intestinal tract. For instance, curcumin, piperin, ginger and capsaicin clearly stimulate pancreatic enzyme production, whereas fenugreek, mustard, cumin and coriander stimulate bile production. Increased enzyme production improves the rate of digestion of the feed, thus improving its nutritional value.

- **Improved nutrient utilisation**

Apart from a better nutrient digestibility, data from broiler trials indicate an improved nutrient utilisation (similar body weight gain at reduced feed intake). However, these effects can vary due to type and origin of the essential oils or herbs and the inclusion level in the feed.

- **Antioxidant effects**

Aromatic plants from the plant family Labiatae (rosemary, thyme, oregano and sage) have been extensively studied for their antioxidant activity. This activity is not only related to the phenolic compounds which have free-radicals scavenging properties but also non-phenolic compounds may show considerable antioxidant activity by enhancing gene expression of antioxidant enzymes. These antioxidant effects are protecting the organism at cell and tissue level, especially during stressful conditions like weaning, reallocation, feed changes, poor ventilation and heat stress conditions. Moreover, positive effects of dietary supplementation with oregano, rosemary and sage on shelf life of poultry meat, as well as eggs, have been reported.

- **Antibacterial effects**

According to some studies, extracts of herbs and spices exert clear antibacterial activity against foodborne pathogens. However, minimum dietary inclusion levels in poultry are generally too high to be able to rely on these antibacterial effects and to be economically feasible. Nevertheless, levels needed to inhibit the expression of virulence factors by pathogenic bacteria (quorum sensing inhibition) are far lower and have been shown to be a promising field of application.

- **Effects in intestinal mucosa**

Several studies indicate positive effects on the intestinal morphology in poultry. Increased transepithelial electric resistance of duodenal mucosa was observed when broilers were fed thymol supplemented diets. Moreover, pungent substances like black pepper, chili and garlic improve blood flow, which might reduce the adverse impact of ischemia of the gastrointestinal tract on intestinal integrity.

The success of plants is no accident

Increased pressure in terms of food safety, raising concerns about bird health and environmental protection, rising feed costs, increasing antibiotic resistance, strong global tendencies to reduce antibiotic growth promoters – these factors explain why phytogenics are seen among the top solution platforms in animal nutrition for the near future.

Due to their content of an infinite variety of active ingredients, phytogenic substances represent one of the most interesting and important classes of current and future feed additives. ■

References are available from the author on request