

Improved nutrient digestibility with phytogenic feed additives

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Efficient utilisation and maximum digestibility of nutrients are essential, especially under today's production conditions. Phytogenic feed additives belong to the most promising additive group, for improving nutrient digestibility.

The original idea to use herbs and spices in animal nutrition was developed by Delacon in the 1980s when it copied the lessons of savoury cooking and seasoning of meals.

The basis remains unchanged to this day: Herbs are used to stimulate the appetite, make meals tastier and more digestible.

They also aid in facilitating the digestion of heavy foods, since they stimulate digestive enzymes and prevent digestive problems.

Active principles

Over the past few years, scientists have studied many important active principles of plant based substances. This is also confirmed by the number of scientific publications on plant based additives, which have increased dramatically in recent years.

The diversity of the plant world offers an enormous range of effects, wherein flavouring and appetite stimulation are undoubtedly the most well known effects of plant based substances. It is in particular the essential oils as well as pungent and bitter compounds that stimulate the papillae in the

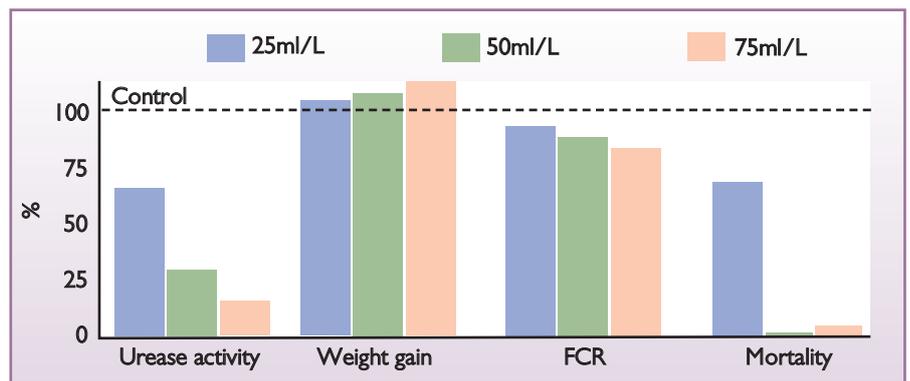


Fig. 2. Effect of saponins on intestinal urease activity and zootechnical performance of broilers (Nazeer et al, 2002).

mouth of animals. This controls the release of gastric juices through the vegetative nervous system, which, in turn, stimulates the appetite.

Animal species with a high number of papillae, such as pigs and cows, respond to this better than poultry, which have only about one tenth of the taste receptors that humans have.

Better feed intake in poultry is generally harder to achieve, as nutrient supply is regulated according to energy demand. Better utilisation of nutrients often leads to lower dry matter intake, because the animal has already gained enough energy.

Individual components of essential oils develop excellent antibacterial effects against a great number of Gram positive or Gram negative bacteria. They are useful in controlling difficult hygienic conditions in ani-

mal production, especially in cases of bacterial pressure. A great deal has already been published under the topic 'antibacterial in-vitro effects'. For the essential oils of cinnamon, thyme and oregano, clear values have already been established for minimal inhibitory concentrations of bacteria.

However, these dosages for 'in-vivo uses' remain very expensive. For example, for oregano oil with a specific concentration of carvacrol of 50%, as much as 1-40 litres/ton of feed is needed to inhibit the growth of different pathogenic bacteria.

Normally, dosages of approximately 10-50g essential oil per ton of feed are used as the standard, which of course only unfolds part of this effect.

An antibacterial use of essential oils can, therefore, be used economically only during difficult adjustment phases or with young animals.

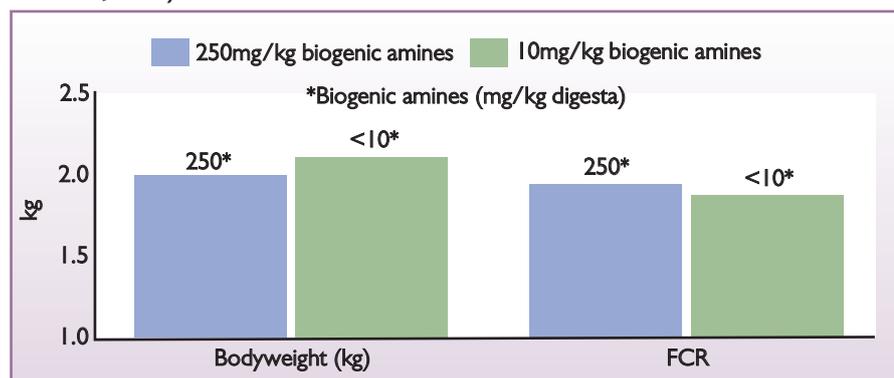
Stabilising digestion

In in-vitro rat studies, Platel and Srinivasan observed distinct effects of increased enzyme activity through the addition of essential oils and spices. Increased enzyme activity can aid in a more rapid breaking down of available nutrients and thus lead to improved digestibility.

Other works show that anise oil has a positive influence on glucose transport in the gut. This occurs through the influence of the Na/K ATPase, that is, the mechanism

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Fig. 1. Effect of biogenic amines on bodyweight and FCR in broilers (adapted from Smulders, 1999).



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responsible for the glucose transport through the lumen of the gut. This should lead to more energy absorption overall. Anise oil stimulates the glucose transport.

Undigested nutrients

Does a nutritive effect exist, which phyto-genic feed additives can exert on the gut in order to stabilise the intestinal flora? Biogenic amines are toxic metabolites, which are formed from undigested protein in the gut and through microbial protein fermentation.

The amines are then absorbed through the

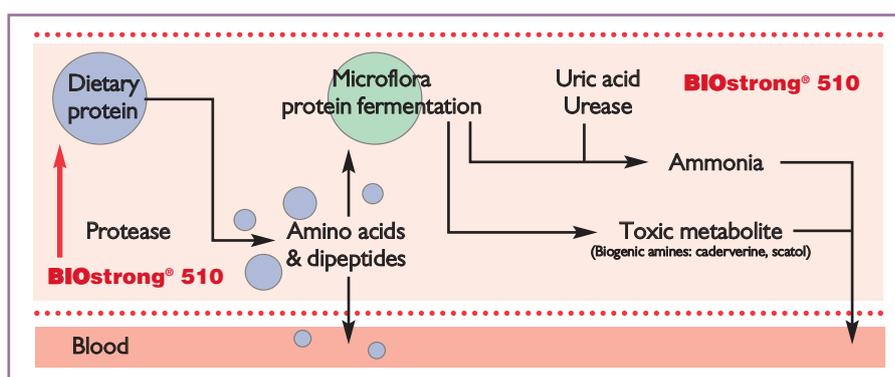


Fig. 3. Phyto-genic additives support the protease and reduce the protein for microbial fermentation. They also inhibit the urease activity, leading to reduced ammonia formation and reduction of toxic metabolites.

gut. Examples for this are cadaverine, which arises from lysine, and scatol, which is formed from threonine.

The higher the content of biogenic amines in the intestinal content, the worse the performance (see Fig. 1).

Studies have shown that combinations of essential oils can reduce the concentration of biogenic amines.

This is likely the result of better nutrient digestibility, in particular of protein. Fewer excess and non-absorbed amino acids in the gut also mean less 'feed' for bacteria.

Effects of ammonia

The negative effect of ammonia on animal performance has already been proven: Barn air ammonia concentrations of 20-50ppm can reduce the performance of poultry by up to 10%.

Besides the harmful effects on humans and the environment, ammonia irritates the respiratory tract and the intestinal flora.

Excess nitrogen produces ammonia, which can also reach the organism through the gut, but is not detoxified by the animal until it reaches the liver. This additionally stresses the animal.

Through better nutrient conversion, phyto-genic active agents can aid in the reduction of excess nitrogen in the gut, or decrease the breakdown of urea into ammonia and carbon dioxide by inhibiting the enzyme urease.

It is especially saponines, which reduce the activity of urease and thus indirectly help to improve animal performance (Fig. 2).

While the direct antimicrobial effect of phyto-genic substances has a rather small role for stabilising the intestinal flora, nutritive effects can still help to reduce the concentration of toxic metabolites and thus improve animal performance.

It is obvious that antibacterial effects of essential oils are not the only way to describe the effects of plant substances. It is rather the knowledge of precise combinations of different effects and substances and their interdependencies with each other that can provide answers to the complex problems of today's animal production. ■