Use of wood-derived additives for optimisation of poultry performance

In the last issue of International Poultry Production we learnt how an innovative feed supplement containing wood lignans contributes to the gut health of broilers. Nevertheless, this was just a small part of the whole picture of how wood-derived feed supplements can contribute to profitable poultry production.

by Dr Stefan Hirtenlehner and Dr Angela Riemensperger, agromed Austria GmbH. www.agromed.at

To get a wider perspective, we need to take one step back and have a look at the most famous wood-derived feed supplement: lignocellulose. Lignocellulose is the processed tree trunk and contains, depending on the product quality, different species of trees or a combination thereof, different parts of the tree (trunk and bark) or comes with different particle sizes. In general lignocellulose is mostly understood as a source of dietary fibre.

Although historically considered an anti-nutritive ingredient, dietary fibre, when applied in a balanced way, reveals various positive effects in monogastric nutrition as scientific studies of recent years show.

Hence, the sceptical view on the inclusion of different fibre sources has gradually been replaced by interest in a proper fibre supply and now receives the attention of poultry nutritionists more and more. Today it is generally accepted that a balanced inclusion of fibre contributes directly and indirectly to proper intestinal functions and promotes the gut health of both broilers and laying hens, as a basis for high resorption capacity of nutrients.

Eubiotic lignocellulose: combining nutritional and functional properties

In this context, the most important criterion is the quality of supplemented fibre. A highly insoluble, slowly fermentable, and mycotoxin-free fibre source will stimulate gut motility and development. These properties are combined in a so-called 'eubiotic' lignocellulose. Eubiotic lignocellulose, derived from fresh wood, is purely insoluble and acts physically optimising its peristaltic activity.

Moreover, it contains a fermentable portion, which will be degraded microbially after passing the small intestine and entering the caecum. Within this fermentation process the formation of volatile fatty acids cause a drop of intestinal pH-value providing an unfavourable milieu for pathogenic bacteria and may be directly utilised by the birds' colonocytes as a source of energy, allowing for an improved gut development.

Consequently, the intestinal villi significantly increase in their length, which improves the intestinal absorptive surface and facilitates the uptake of nutrients and minerals.

Further, lignocellulose supplementation may influence the microbiota in the ileum and caecum, which may contribute to an improved digestion of poultry diets. Consequently, the performance of broilers as well as laying hens may be beneficially affected. Another reason why it is too short-sighted to consider eubiotic lignocellulose as a functional fibre source only is the presence of wood-derived polyphenols as bio-active molecules. These molecules allow eubiotic lignocellulose to act as a nutritional additive influencing the oxidative status of the birds or reveal anti-inflammatory and gut protective effects.

This effect was measured in a feeding trial under controlled conditions in Germany in 2021, when 48 laying hens in a late laying cycle (from 60-75 weeks of age) were randomly allocated to two treatments. Birds were either fed a standard diet, or a diet supplemented with eubiotic lignocellulose (OptiCell, agromed Austria GmbH).

Hens fed the diet supplemented with lignocellulose consumed significantly more feed compared to the control diet. Moreover, egg production and feed-to-egg-mass ratio were improved significantly.

The application of the eubiotic lignocellulose did, on average, numerically enhance egg mass output (+4.3%), egg number (+3.1%) and mean egg weight (+1.0%) in comparison with the control group, so that the FCR (relative to egg mass) was significantly improved from 2.13 (control group) to 2.04 (lignocellulose group).

Although egg mass and egg weight were clearly increased, lignocellulose supplementation even slightly improved eggshell stability (44.5 N) compared to the control group (42.0 N).

One possible mode of action for these findings is the effect of anti-oxidative properties of the used lignocellulose. Table 1 reveals a significant reduction of TBARS (thiobarbituric acid-reactive substances) together with an improved enzyme activity of SOD (superoxide dismutase) – both results give proof of an improved antioxidative status.

Continued on page 36

Table 1. Antioxidative parameters measured in the blood of 75-week-old laying hens.

	Control	Lignocellulose
SOD activity (U/g Hb)	1,715 ± 114[b]	1,978 ± 241[a]
TBARS (nmol/ml)	4.7 ± 0.1[a]	4.2 ± 0.2[b]

Continued from page 35

Focus on wood-derived bio-active molecules for broiler performance

Another, rather novel and innovative way to apply wood for the optimisation of poultry performance is the use of certain tree species rich in selected bio-active molecules supplemented in the poultry feed.

One of these wood-derived products (agromed ROI, agromed Austria GmbH) comprises a bark containing species-specific lignans, which are known to elicit anti-inflammatory, antibacterial and antioxidative properties.

Lignans are natural polyphenols found in many plants, where they exert protective effects against infection. For the use of wood lignans in animals, anti-inflammatory and antioxidant effects have been scientifically described: they decrease gene expression of various proinflammatory cytokines and bind free radicals and thus reduce lipid peroxidation and diminish the formation of hydroxyl radicals.

The combination of those effects attenuates inflammatory processes in the birds, which are permanently challenged with external (flock density, suboptimal climatic conditions) and internal (rapid growth rate) stressors. Since inflammation is an intensive energy-requiring process, its attenuation can be seen as a cost-saver and, consequently, this saved energy will be channelled into growth performance.

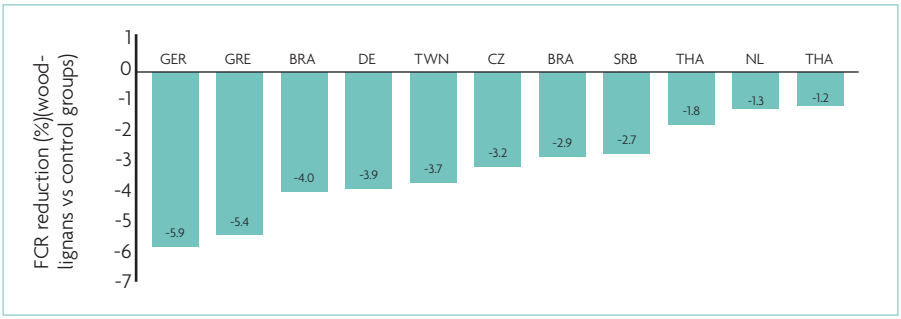

Fig. 1. Overview of FCR improvement due to supplementation with a wood-derived feed supplement relative to a control group. Data obtained in different regions of the world.

Fig. 1 summarises the efficacy of dietary supplementation of wood-derived complementary feed when applied in different parts of the world. Each bar on the x-axis represents data of a feeding trial conducted with broilers, whereas on the y-axis the relative change of feed conversion compared to a non-supplemented control group is illustrated.

An average of 11 feeding trials revealed an improvement of FCR of 3.3% due to the wood-derived feed supplement. A reduction of FCR by 0.1 results in 3% less excretion, which means consequently 3% less nitrogen and phosphorus excretion.

Thus, improving FCR contributes not only to farm profitability but also to sustainable poultry production.

Conclusion

Feed supplements derived from fresh wood vary strongly in their nature. Next to standard lignocellulose products, which are mainly used to optimise the fibre content of the bird's diet, an eubiotic lignocellulose has a broader spectrum by combining nutritional and functional properties.

Moreover, the selection of the proper raw material allows for phytonutrients rich in bio-active molecules which are potent to beneficially influence poultry physiology and allow for best performance. ■