

# Six nutritional considerations when feeding DDGS to layers

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**T**he greatest challenge in using DDGS in pullet and layer diets is working with accurate nutrition matrices. The nutritional composition and quality differ substantially between sources of DDGS. For example, the conditions during the drying process have a huge impact on amino acid digestibility. DDGS users are often tempted to use colour as an indicator of DDGS quality, with energy and protein levels as the main criteria applied to decide whether or not to use it. However, there are also other aspects to consider when birds are fed DDGS.

## • Amino acid digestibility

Visually we can gain a rough idea of the effect of heat damage on DDGS: a darker colour indicates overheating and thus reduced protein quality and lower amino acid digestibility. However, visual inspection with the human eye is subjective and heat damage is not the only factor which can affect colour. DDGS will also be influenced by the maturity of the grain, the amount of solubles added, storage conditions, the presence of toxins, contamination with sand, as well as the possible use of insecticides or fungicides which will give it a dull and dusty appearance. DDGS contains proteins and carbohydrates which when exposed to high temperatures during the drying process can produce a chemical reaction (Maillard reaction) that affects the digestibility of its amino acids. Thus, more reliable heat damage indicators than just colour are needed to evaluate quality. The amino acid Lysine is very susceptible to heat damage and the Maillard reaction. The reactive Lysine assay is very specific and measures only that amount of Lysine which did not take part in any Maillard reaction and is therefore potentially available to the animal. Reactive Lysine is an excellent indicator for heat damage and correlates well with changes in amino acid digestibility. Classically, the reactive Lysine assay is a very demanding wet chemistry method. Today however, Near-infrared Spectroscopy (NIR) techniques are available that can determine the

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## • Phosphorus availability

Although there is consistent evidence that excessive heating (dark colour) during DDGS drying reduces the digestibility of amino acids, it may increase the relative bio-availability of phosphorus for poultry. Studies suggest that the fermentation process which the corn undergoes improves phosphorus availability in the by-product. The synthesis of microbial phytase during fermentation and structural changes caused by the drying process may increase phosphorus bio-availability.

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PHOTO: PETER JUNGHEI



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#### • Mycotoxins

Mycotoxins are one of the biggest concerns leading to low dietary inclusion rates of DDGS. Nutritionists try to minimise total mycotoxin content because mycotoxins can have significant adverse health and performance effects. Clearly, the fungal contamination of grain used for the DDGS product, the drying equipment and storage could lead to a greater prevalence and concentrations of mycotoxins. During the fermentation process the corn starch is converted into alcohol and the remaining corn components of corn are accumulated. Thus, DDGS typically contains three times more nutrients like amino acids than corn, but this also applies to mycotoxins. Fungal toxins cannot be destroyed by heat during the drying process. If the source of the corn is contaminated with fungi toxins, DDGS will have three times more mycotoxin content as well.

#### • Oil oxidation

DDGS are traditionally rich in fat and thus very attractive economically when working with layers. Nutritionally the high fat content is also interesting due to high concentrations of polyunsaturated fatty acids which are important for yolk formation, particularly linoleic acid that positively influences egg weight at production onset. Unfortunately, polyunsaturated fatty acids are highly susceptible to oxidation and drying processes accelerate this process. Feeding diets with oxidized lipids negatively affects the liver status and, as a result, egg quality and egg production. NIR provides a fast and reliable way to assess fat quality and determine the fatty acid content of DDGS, alongside other analytical methods, such as the TBARS (Thiobarbituric acid reactive substances) test that can give a good estimation of lipid peroxidation.

#### • Yolk pigments

DDGS can provide a good source of pigment for the yolk. Pigments like xanthophylls or carotenoids are liposoluble nutrients that cannot be synthesized by birds. Therefore they must be offered in the diet. DDGS inclusion levels have been shown to result in better distribution of colour particles during feed mixing in comparison with smaller dose products. DDGS provides a good yellow pigmentation base and thus reduces diet cost while meeting consumers' desired egg yolk colour quality standards. However, lighter coloured DDGS is more likely to contain larger amounts of xanthophylls than darker coloured DDGS due to its liposoluble nature. Overheating of DDGS may cause oxidation of carotenoids resulting in lower concentrations. Complementing the yolk pigmentation using natural or synthetic products over a homogenized base of yellow from DDGS is therefore recommended.

#### • Sulphur content

Sulphuric acid is commonly added during the dry grind ethanol production process to keep pH at the desired level to ensure optimal yeast propagation and fermentation for efficient starch to ethanol conversion, as well as for cleaning purposes. However, sulphur is one of the core chemical elements needed for biochemical functioning and is a key macronutrient for all living organisms. Despite its importance, sulphur levels greater than 0.6% in poultry can produce wet litter problems, while 1.2% sulphur results in depressed growth. However, it is very unlikely that DDGS will contain very high levels of sulphur. However, the general concern about sulphur levels in feeds and how using DDGS influences them, is reasonable. It is therefore important to consider the sulphur additivity of other feed ingredients, too.

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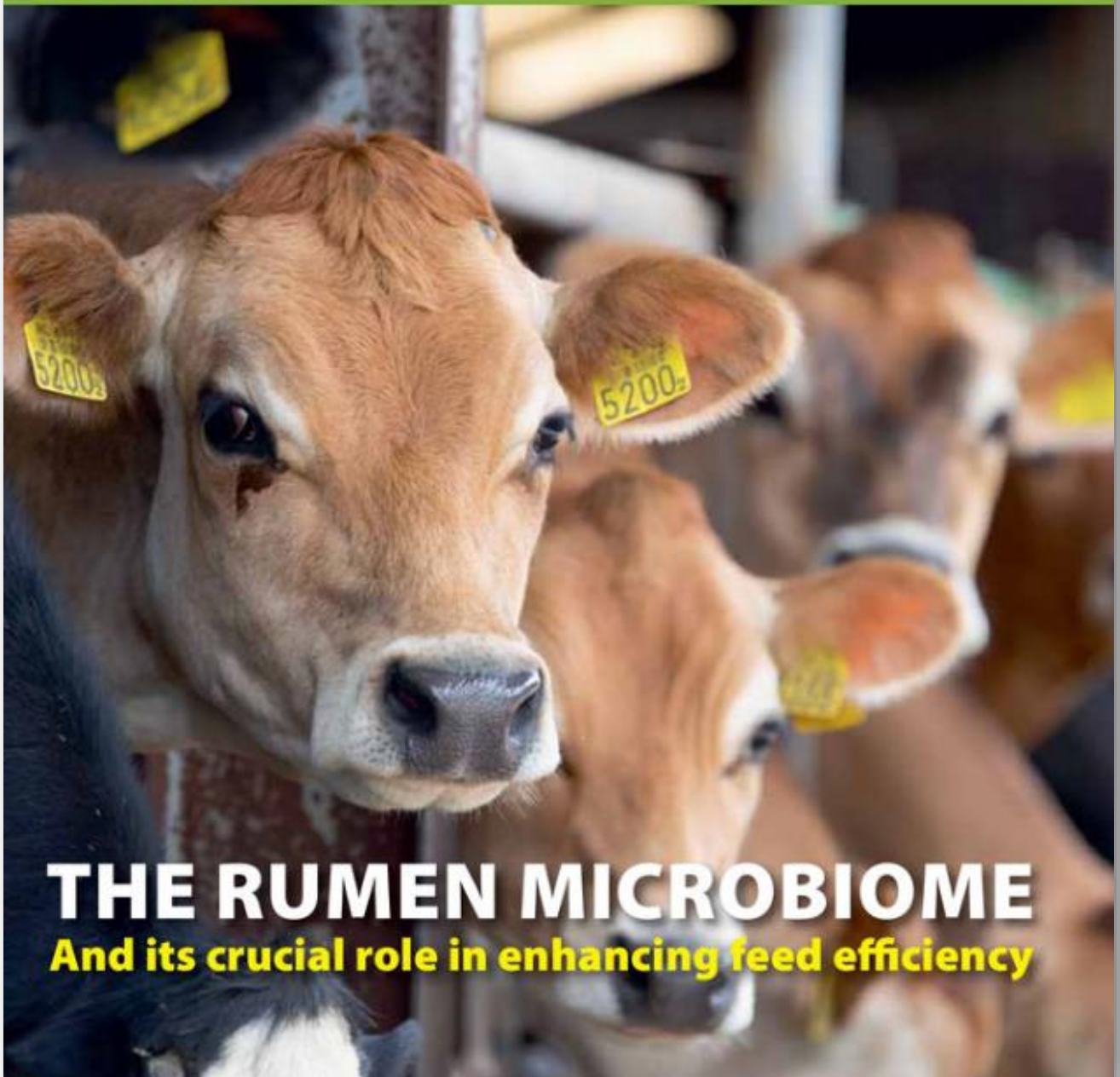
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