Abstract IFOAM

Title: Optimal utilization of natural phytase activity in feed grains for monogastric animals.

Abstract

The aim of this work is to improve the phosphorus utilization in organic pigs and poultry, for lower phosphorus usage and leakage. To reduce leaching of phosphorus in the manure from monogastric animals, it is essential that phosphorus utilization in the feed for pigs and poultry is optimized. Monogastric animals are unable to digest the phosphorus containing phytate, as they lack digestive enzymes (phytase) that can break it down. All cereal species have phytase in the kernels, but the amount varies between species and varieties. New feed mixing concepts are developed, to reduce addition of phosphorus in the feed. On-farm trials in pig herds will be conducted in farms with home-mixed feed and with fabricated and pelleted feed, where a large proportion of grain is not being pelleted. The results will show whether the slaughter pigs are provided with sufficiently digestible phosphorus with the new feed concepts. Similar trials will be conducted in poultry farms.

Background

Phosphorus is a limited resource (Walan et al., 2014). Loss of phosphorus from slurry and manure can also be detrimental to the aquatic environment. In order to reduce the leaching of phosphorus in the manure from monogastric animals, it is essential that phosphorus utilization in the feed for pigs and poultry are optimized. Phytate or phytic acid is the main storage form of phosphorus in grains and oil seeds (Gupta, et al.,2015). Monogastric animals are unable to digest phytate, as they lack digestive enzymes (phytase) that can break it down (Humer et al. 2015). As a result, a substantial amount of phosphorus is excreted as waste, equivalent to approximately 50% in wheat (Jacela J.Y. et al. 2010). At the same time, phosphorus is an essential element, readily available inorganic phosphorus, is typically supplemented into the diet to meet the animal's requirements.

An effective way to improve phosphorus utilization in the feed, is through increased phytase activity. Phytase can release phosphorus bound in the form of phytate. Conventional producers can add this enzyme to the feed mixture, whereas organic producers must rely on naturally occurring phytase in the feed grain. Today, inorganic phosphorus is added to the organic feed mixtures as monocalcium phosphate to reach the desired amount of phosphorus in the feed mixture. Instead utilization of the phosphorus already in the grain should be increased by optimizing natural phytase activity, either from variety choice / species choice / cultivation or handling of the compound feed. Especially rye has a high phytase content (Eeckhout, W. and M. De Paepe. 1994). But rye is less suitable for poultry feeding and as such, there is a subsequent need to work with wheat and triticale. The project fulfills a need for more knowledge about the potential for natural phytase activity in different types of feed grains grown under different cultivation conditions, and for optimal handling and composition of feed mixtures.

Purpose

The aim of the work is to improve the phosphorus utilization in organic pigs and poultry, for lower phosphorus usage and leakage.

Material and Methods

Phytase and cereal

There is limited knowledge of the content of phytase in cereals. We know that there are species differences and that winter rye is generally high, and barley is low in phytase. Varieties from ongoing field trials and observation plots are sampled and analyzed for phosphorus and phytase content. Samples are taken from harvest autumn 2019 and again in 2020 and 2021. Organic field trials are carried out in spring and winter

cereals at six sites with four repetitions. Only the most promising and healthy varieties of relevant species (rye, wheat, triticale) and mixtures are tested. Selection of varieties for trials will be based on the initial screening experiments, knowledge gathered from the breeders, and from the literature. Phosphorus and phytase content will be analyzed.
Theoretical calculations are made to determine the minimum inorganic phosphorus that can be added to organic pig and poultry feed mixtures, when raw materials with high phytase activity are used, as well as calculations of what is needed to avoid addition. Values from the pig feed tables and from screening of varieties are used in the first calculations. The theoretical calculations are coupled with practical trials by organic pig and poultry producers to determine whether the effect is consistent with theory.
A concept for the feed mixing procedure will be developed for the feed companies with reduced addition of phosphorus to feed mixtures for pigs and poultry. It is investigated which types of grain and how much of the grain, can be handled outside the pelleting process to prevent phytase activity from being destroyed in the heating process during the pelleting. Likewise, it is being investigated whether the feed systems of the organic pig producers can handle grain, bran or other, outside the pelleting processing in large quantities. The mixing concept is based on theoretical calculations in relation to the composition of the feed mix and based on tests with feed handling and practical tests at the feed companies and farmers.
Also, a concept for feed mixing for the farmer that do feed mixing on the farm will be developed. Likewise, this concept will have reduced addition of phosphorus to compound feed for pigs and poultry. This mixing concept is based on theoretical calculations in relation to the composition of the feed mixture and based on experiences with handling the raw materials and practical challenges. There will be 2 on-farm trials; one with home-mixed feed and one with pelleted feed, with large grain proportions not being pelleted, mixed into a feed.

Results

We will present preliminary results of pig trials on the effect of natural phytase activity in feed grains and the effect on phosphorus balance in finisher pigs (30-110 kg). Analyses of the feed mixtures will also be presented. The samples are analyzed for dry matter, crude protein, phosphorus and calcium to ensure the right amount of phosphorus and calcium in the feeds. A total of approx. 700 urine samples of slaughter pigs will be carried out. Some samples are taken before trial starts to ascertain whether the animals are adequately provided with phosphorus. The remainder is taken during the growth period and analyzed for phosphorus, calcium and creatinine. The results will show whether the slaughter pigs are provided with sufficiently digestible phosphorus with the new feed concepts.
Feed consumption and daily growth at the herd level are recorded, as well as the number of deaths and treatments. This is compared to the normal production levels of the herds.

Results from field trials will also be presented to demonstrate the potential of increasing natural phytase content by means of species and variety choice.

Discussion

There are no results available for discussion so far. It is expected that the natural phytase activity will reduce the addition of phosphorus as mono calcium phosphate to feeds for monogastric animals.

References

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STØTTET AF

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