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MINERAL Writes

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Phosphorus in Soybean Meal Based on Production Area

Soybeans contain 1-2% phytic acid, which results in up to two-thirds of the phosphorus being bound to phytate, (Deak and Johnson, 2007). Phytase is an enzyme that is added to animal diets to break down the phytate and increase P digestibility. Research has determined that adding 500 kg of phytase/units of feed can have the greatest improvement in P digestibility in soybean meal (Traylor et al., 2001). In addition to knowing that soybean meal contains P bound to phytate, Grieshop et al, (2003), found that the entire chemical composition of soybean meal is dependent on where the beans are grown. However, that study did not go so far as to determine if there are differences in the phytate concentrations in soybean meal (SBM) from different areas.

Sotak-Peper et al., (2016), recently published results of their research on phytate concentrations based on production area. The researchers tested the hypothesis that the soybean production areas may influence the P, phytate, micro- and macromineral concentrations in SBM. They also looked at the inclusion of phytase to increase P availability in SBM in swine.

Experiment

Sotak-Peper et al., (2016), used SBM from 20 crushing facilities in the United States. They divided the sources into three regions: 1) the northern growing region (Michigan, Minnesota, and South Dakota), 2) Eastern growing region (Georgia, Illinois, Indiana and Ohio), and 3) the western growing region (Iowa, Missouri and Nebraska). Two hundred growing barrows were divided into five blocks and fed one of 40 diets, (each diet was fed to five pigs).

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The diets were all based on a mixture of cornstarch, sucrose, soybean oil and SBM. The SBM was the only source of P in the diets. Two diets were formulated with SBM from each of the three regions. One contained no microbial phytase and the other included 500 units/kg of supplemental phytase. Other vitamins and all minerals, except P, were included to meet or exceed the estimated nutrient requirement for growing pigs (NRC, 2012) and the same amount of calcium carbonate was added to all diets. Researchers recorded feed intake daily, and weighed the pigs at the beginning of the feeding period to determine feed allowance. Feed allotment was determined to be three times the estimated energy requirement for maintenance. Pigs received the experimental diets for 10 days. The first four days were the adaptation period. Fecal samples were collected for analysis following the adaptation period. Phytate-bound P was calculated to be 28.2% of the analyzed phytate concentration of the diets (Tran and Sauvant, 2004). To determine non-phytate bound P percentages, phytate-bound P was subtracted from the total P concentration in SBM.

Findings

Production regions did not make any difference in the concentration of dry matter, Ca, P, phytate, phytate-bound P, percentage of total P bound to phytate, and nonphytate P as a percent of total P in SBM. Concentrations of nonphytate P tended ($P = 0.055$) to increase in SBM from the western region compared to SBM from the northern and eastern regions. Mineral concentrations (Mg, K, Na, S and all microminerals) did not differ among the three production regions. Microbial phytase was not found in the nonphytate diets, and the phytase concentrations in the diets with microbial phytase were close to the expected 500 units/kg.

Sotak-Peper et al, (2016), did not find differences in the absorbed P, digestibility of P, Ca intake, Ca output or the digestibility of Ca among the production regions. They did note an increase in absorbed P, digestibility of P and Ca when diets were supplemented with microbial phytase ($P = 0.05$). The inclusion of microbial phytase also was found to decrease the amount of P and Ca excreted in feces ($P = 0.0001$).

Conclusions

In this study, all sources of the SBM from each of the regions contained high concentrations of phytate, but the findings of no difference in P, phytate, or phytate-bound P among the regions indicates that regional variability has little effect in the P and phytate concentrations. There was a difference in Ca concentrations in SBM from the western region in comparison to previous research (Rojas and Stein, 2012), but the current study suggests that adding calcium carbonate to improve flowability at the production plant accounts for this difference.

The majority of the mineral concentrations were in agreement with values reported by the NRC. Previous research has found that regional differences in soil conditions may impact mineral concentrations in soybeans and therefore in SBM (Gustavsson et al., 2001).

Supplemental phytase increases the amount P available to the animal, and this result was observed by the researchers (Sotak-Peper et al., 2016). This experiment also indicates that Ca is bound to phytic acid in SBM and is released by sup-

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plemental phytase. However, the digestibility of Ca was less than in previous studies of supplemental phytase, but may be due to the higher inclusion of calcium carbonate in the experimental diets.

What this means for the industry

Ultimately, this experiment shows that Ca, P, phytate, and macro- and microminerals in SBM are not influenced by the growing region in the United States and that phytase supplementation increases the digestibility of P and Ca for SBM, regardless of the growing region. As an industry, this means that we need to continue to focus on the nutrient concentration and effects of phytase on feedstuffs in the diet and not where they come from to determine industry standards and practices.

Information for this article taken from:

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Solid as a Rock for 90+ Years

While many *Mineral Writes* articles focus on calcium carbonate as a feed ingredient, another product option is Dairy-White Sweet Barn Lime. With the unique screening and blending process used by ILC Resources, two grades of Dairy-White Barnlime are produced. One is a "coarse" grade and the other is "regular."

The product has four distinct benefits when it is used, regardless of grade (coarse or regular). The product adsorbs moisture, reduces odors, enriches manure and is non-caustic to animals and humans. The Barnlime is thoroughly dried as part of the ILC Resources production process, which makes it such an effective adsorbent. The risk of slippage and injuries is reduced when the product is applied to barns, loafing sheds, farrowing houses, pet areas, horse stalls, alleyways, poultry houses and many other livestock facilities. The coarse particles provide traction and the regular (smaller) particles adsorb the moisture.

Secondly, the Barnlime acts to chemically neutralize acid thereby reducing odors. By "sweetening" the air in a livestock barn, it may be obvious where the inspiration for the "Sweet" name came from. In addition, by enriching the manure with this product, when it is applied to fields, the soil is fertilized and the soil acidity is reduced. This contributes to moving the soil pH to a more optimum level for nutrient uptake, which occurs at a greater rate closer to a more neutral pH between 6.0 and 6.5. While obviously attractive to livestock operations, this fact makes agronomic sense for crop production.

It is also important to remember that Dairy-White Sweet Barnlime is non-caustic to either livestock or humans. This means the product is environmentally harmless and safe to use in areas mutually utilized by animals and humans.

Dairy-White Sweet Barnlime is used in more than just dairy operations. It has been and is used in swine, poultry and a wide variety of other animal facilities. The product reduces the instance of slipping and risk of subsequent injury by adsorbing moisture, "sweetens" the air by neutralizing odors from the build-up of animal wastes, and by enriching that manure and then, when added to the fields, enriching the soil. This is an ideal environmentally friendly product, non-caustic to humans and animals and has been proven beneficial time and time again over the 90+ years of its production by ILC Resources.