Assessing the effect of ingredient variability, evaluated by NIRS, on the variation of the final feed and its theoretical impact on raising growing fattening pigs

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Abstract

The present study was carried out to assess the variability at three different levels: characterizing the chemical composition of 11 common feed ingredients; assessing their impact on the final feed composition according to feed formulation; and finally, predicting the potential effect of the variability in ME content of final feed on growing pig performance. Dry matter, crude protein (CP), crude fibre (CF), ash, starch, or ether extract or sucrose (only for some ingredients) content in feed ingredients was analysed by NIRS technology. Therefore, metabolizable energy (ME) and lysine (LYS) content were estimated. Among ingredients, the variability assessed as coefficient of variation (CV %), was highest for CF (2.6-18.3%), followed by CP (2.0-9.3%), LYS (1.6-7.7%) and ME (0.9-6.0%). The assessment of diet variability was performed through three diet types: 1. limited number of European ingredients; 2. common European; and 3. multi-ingredient (five, seven and ten ingredients, respectively), on two diet specifications: fattening pigs (F) and gestating sows (G). At this framework, diet variability was calculated by Chung and Pfrost (1964) equation. This showed that comparing all diets, the chemical components clearly variable (CF, CP, LYS and ME), reduced variability as more ingredients were included in the diet. To measure the isolated effect of ingredients ME variability on the production, a growing pig case of 700 pigs was used to evaluate the negative impact on growth performance driven by ingredient variability (V), and then, compared to the expected performance (control, C). A specific diet was formulated according to sufficient 30-105 kg of BW (FEDNA, 2013). Three samples per ingredient (in the formula) and month (NIRS), constructed chronologically 15 different feed batches to be consumed in the growing period: one in the average and two, 1.5 SD above and below that (regarding CP or CF depending on ingredients). Finally, through detailed pig growth (Gompertz function), pig requirements (based on BW) and the ME content of each batch, the feed intake (FI) was calculated. An increase of 1.6 kg was observed per pig comparing the calculated for V vs. C. Although, a low negative impact of the ME variability on the feed conversion rate was observed, the additive negative impact of the high variability of other nutrients with strong impact on growth (i.e. CP) may probably cause greater impact on performance. In conclusion, when ingredient variability is not taken into account, there is an unknown deviation from the diet specification that may have negative consequences on animal performance. This will mainly depend on, the error size in a feed batch and the frequency of those, respectively. Therefore, it is recommended to undertake strategies to minimize disregarded variability of the ingredients and to use NIRS information in this way.

Keywords: swine; feed ingredients; raw materials; feed variability; nutrients; chemical composition.
Sanguinarine as alternative to antibiotic growth promoters in pig nutrition. Effect on growth performance, diarrhea incidence, serum metabolites and antibodies

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Abstract
Sanguinarine extracted from Macleaya cordata, as an alternative to antibiotic, is of great practical and research interest, due to its anti-microbial and anti-inflammatory responses in experimental animals. This study was conducted to determine the effect of dietary supplementation with sanguinarine on growth performance, diarrhea incidence, serum metabolites and antibodies in growing pigs. A total of 120 [Yorkshire×(Duroc×Landrace)] pigs, at 6 weeks of age (3 weeks postweaning) were randomly allotted to 3 dietary treatments. The dietary treatments were: the basal diet (BD)-fed group, the sanguinarine (sangrovit®)-fed group (BD+0.04 g/kg), and the antibiotic-fed group (BD+0.2 g/kg colistin) (n=40 per group). On days 7, 14 and 28 after initiation of treatment, serum levels of amino acids (AA), antibodies and some biochemical parameters were measured. Sanguinarine used as supplemental increased (P < 0.05) the average daily feed intake (ADFI), average daily gain (ADG), nutrient intakes and final body weight (BW), improved the feed/gain ratio (F/G) (P < 0.05), and reduced (P < 0.05) the diarrhea incidence in growing pigs compared with the non-additive and antibiotic groups. Results indicated that the sanguinarine increased (P < 0.05) the serum contents of AA, such as Gly, Ile, Lys, Met, Arg, Ala and Thr in comparison with the antibiotic-supplemented group and/or BD on days of trial. In contrast to colistin, sanguinarine-fed group decreased (P < 0.05) serum level of triglycerides and increased (P < 0.05) concentration of glucose, as well as this treatment enhanced (P < 0.05) serum concentration of IgG, but only on day 7 in relation to the other two groups. These findings indicate a beneficial effect of the dietary supplementation with sanguinarine on growth performance, serum concentration of some essential and non-essential AA, humoral immune response and diarrhea incidence, which may offer an effective alternative to antibiotics for growing pigs.

Key words: antibody, diarrhea, growth performance, pig, sanguinarine, serum metabolite