Application of low CP diets in practical piglet diets in Germany

Abstract

A low dietary crude protein (CP) content for piglets is known to have a positive impact on animal health, economics, and environment.
In this study we wanted to demonstrate that the implementation of low protein diets in practical commercial conditions is possible without compromising production performance. Therefore, 782 piglets were allocated to one of two treatments: a control diet with an already low CP value against a treatment group with a further reduced CP level (low CP group). Performance parameters were measured over the experimental period of four weeks.
Over the total experimental period, average daily gain, final bodyweight, and feed conversion ratio (FCR) of piglets were not affected significantly by treatment. Interestingly, the piglets fed with the lower CP level showed numerically better performance results.
It was concluded from the present study that the application of low CP diets into practical conditions is possible while maintaining a high animal performance.

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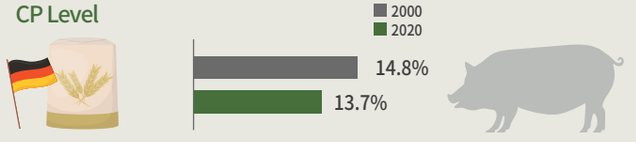
Background

The impact of livestock production on the environment is significant [1,2,3]. Low crude protein (CP) diets can help to decrease the amounts of excess dietary non-essential amino acids (AA) [4]. Consequently, reducing dietary CP reduces nitrogen (N) content and, therefore, pollution potential of the resulting manure. In an isoleucine requirement study a CP level of 15 % lead to excellent performance results in weaning piglets when the AA pattern is optimal [5]. However, especially in practical diets, low-protein diets may fail to support equal growth performance to that of high-protein control diets. A variety of reasons can be responsible for this discrepancy, e.g. the missing availability of up-to-date digestibility values for all raw materials, or due too unexpected high amino acid fluctuations in the raw materials, or simply because next limiting amino acids are not taken into account enough.
In a study of the German feed manufacturer association, it was shown that considerable progress has already been made in the last 20 years in reducing crude protein in compound feed [6]. E.g., while the average CP level of the late fattening period in Germany was about 14.8 % in 2000, the CP level decreased to 13.7 % on average in 2020 [6]. The increased availability of free amino acids, namely isoleucine (Ile) and histidine (His), may allow to further reduce the dietary protein content in practical swine diets.



Average CP level in fatteners in Germany
Source : DVT, 2021

Methods

In cooperation with a German compound feed producer, a study was performed to test a CP reduced diet against a market-usual piglet feed (control) under commercial rearing conditions.

782 piglets were weighed prior to the trial start and equally allocated to one of two treatments (control vs low-CP), to get an uniform distribution between the groups regarding start weight and sex. The experiment lasted for 4 weeks, starting post-weaning with an average piglet weight of about 6.3 kg. Animals were reared in a commercial piglet unit in North-West-Germany and fed in a 3-phase feeding system. The diets were mainly based on barley, wheat, and soy products. The control diet had a CP level of 17.7 % (phase 1), 17.6 % (phase 2), 17.4 % (phase 3) and supplemented with essential amino acids (Lys, Met, Thr, Trp, Val) to meet the animals assumed requirement values. In the low-CP diets the dietary CP level was reduced by about 1 % to 16.5 % in phase 1 and phase 2. In order to keep the AA pattern between the treatments stable and according to assumed requirement, a supplementation of Ile and His was needed.

The response of the piglets to the experimental treatment for final body weight, average daily gain (ADG) and feed conversion ratio (FCR) were analyzed with a two -sample t-test assuming equal variance.

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Results

No statistically significant difference in technical performance of the piglets could be observed in the low-CP group in comparison to the control group. However, animals which received the low-CP feed showed a numerically higher ADG (Figure 1) and lower FCR (Figure 2). Consequently, final bodyweights of the piglets in the low-CP treatment (27.95 kg) were also numerically higher than in the control diet (27.46 kg).

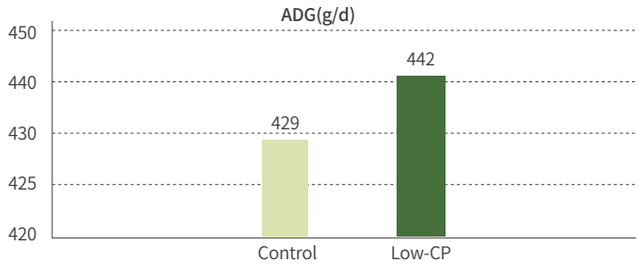

Figure 1. ADG (Average daily weight gain) [g/d] (total trial period) of piglets fed either with a control diet or a low-CP diet

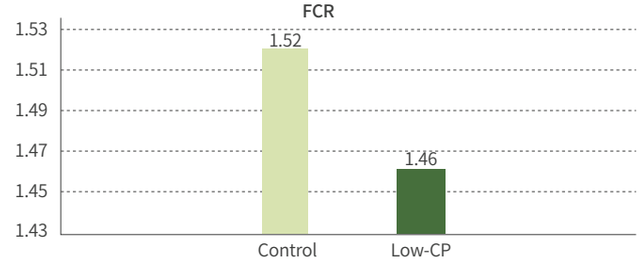

Figure 2. FCR (total Trial Period) of piglets fed either with a control diet or a low-CP diet

Discussion

Nitrogen excretion is still one of the major critics of modern pig production. It can be estimated that for each 1 % decrease in CP the N-reduction is up to 10 % [7]. In earlier studies an additional environmental benefit was described through the reduction of dietary protein from 14.5 % to 12.0 % which had a significant impact on manures concentration of volatile fatty acids, phenol and N_2O [8]. Besides the environmental impact, excessive dietary protein may be fermented in the hindgut and consequently be associated with gastrointestinal disorders like post-weaning diarrhea [9].
The advantages of low-CP diets are well known, but especially the availability of more and more crystalline amino acids such as Ile and His in the market makes a further reduction of CP beyond the current already low CP levels in Germany possible. The results of this study showed clearly that a further CP reduction around 1 % is possible while maintianing animal's performance.

Conclusion

Modern feeding concepts enable a significant reduction in the use of nutrients, especially in crude protein.
The present study demonstrated that no performance losses or a slightly increased performance were visible under commercial conditions when piglets fed with a CP reduced diet with adequate essential AA supplementation.
This development is relevant for the environmental impact of animal production.

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