A 30% extra dose of crystalline lysine, methionine, threonine, tryptophan and valine in relation to the "Ideal-protein-concept" halves piglet diarrhoea outbreaks

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Background

Low-protein diets are known to efficiently reduce diarrhoea but also reducing growth and feed efficiency in pigs.

Objective

The aim of this study was to determine the effect of protein concentrations and crystalline lysine, methionine, threonine, tryptophan and valine relative to the "Ideal-protein" on productivity and diarrhoea incidence.

Materials and Methods

A study was conducted with 6,454 piglets in a surface-response trial with four protein concentrations and five levels of added crystalline amino acids (AA) with 23 replicates of 20 treatments. Methionine, threonine, tryptophan and valine were kept in the proportions 32, 62, 22 and 67%, respective to lysine. The protein ranged from 13.8-21.8% crude protein (CP). The AA ranged at each protein level from 99-136% standardized ileal digestible (SID) lysine:leucine (Lys:Leu), expressing the added crystalline AA:protein. 100% SID Lys:Leu approximates the internationally used "Ideal-protein"-ratio between essential SID AA:lysine. Statistical analyses were conducted with classical surface-response methods in SAS.

Results

Productivity improved with increasing protein (average daily gain (ADG): P<0.0001; feed conversion ratio (FCR): P<0.0001) and with higher doses of the five crystalline AAs (ADG: P<0.0038; FCR: P<0.0001). ADG peaked at 20.6% CP and 113% SID Lys:Leu. The best feed efficiency was reached at 21.8% CP and 131% SID Lys:Leu. The average diarrhoea treatment days/pig/49 days (ADTDPP) increased from 1.7 to 7.1 curvilinearly to protein concentration (P<0.0001). ADTDPP decreased linearly with minimum a factor 2 when elevating the concentration of these five AAs from 100% SID Lys:Leu to 130% SID Lys:Leu (P<0.0001) at all protein concentrations. See Figure 1.

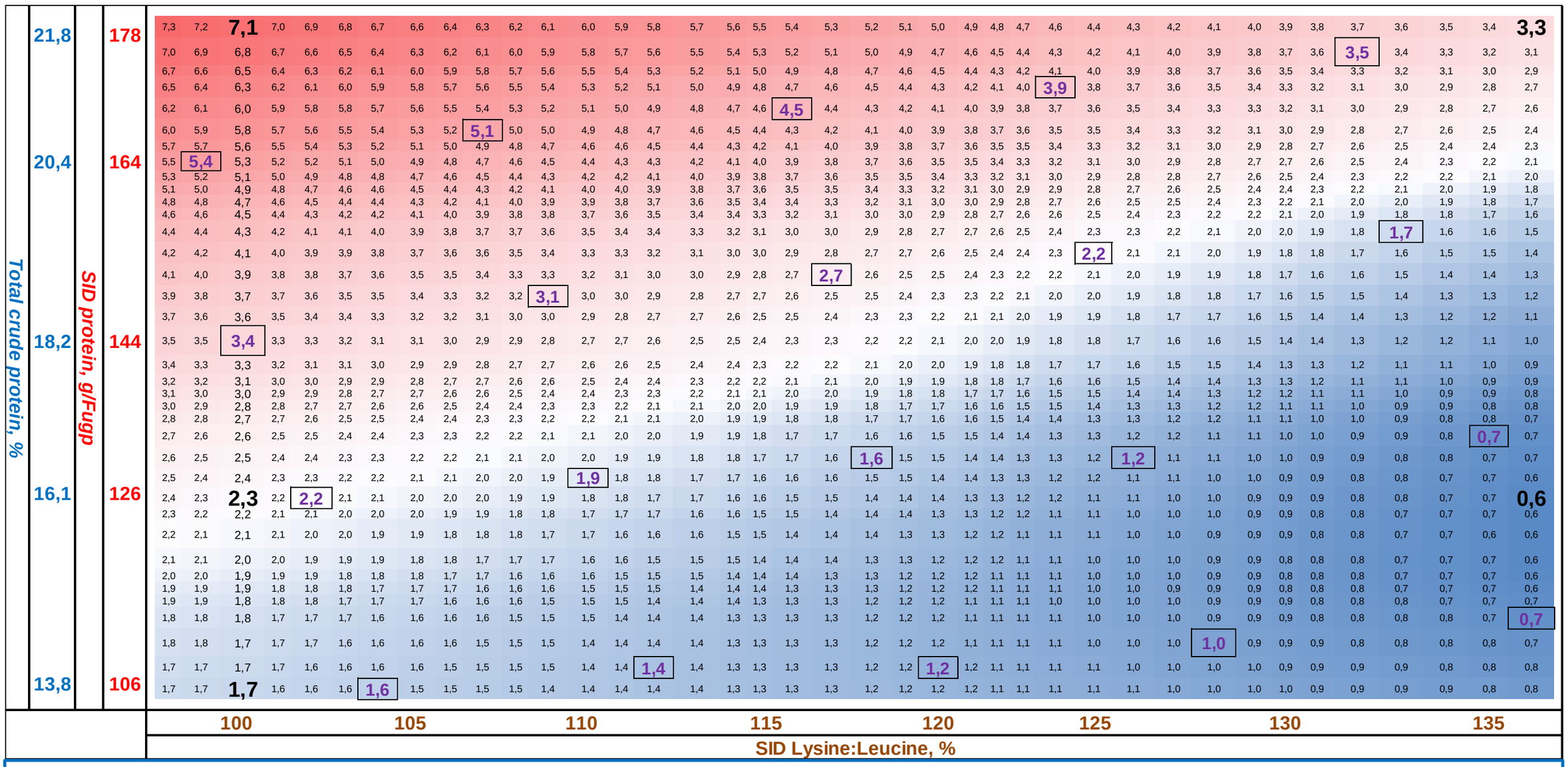

Figure 1. Effect of protein and an extra dose of five free AA on diarrhoea treatments per pig per 49 days in trial.

X-axis = SID Lysine:Leucine, %. **Y-axis = Total crude protein, %**, **and SID protein, g/FUgp** (1 FUgp = 8.8 MJ NE (CVB))

The lowest incidence of diarrhoea treatment has dark blue-, the highest has dark red background

Conclusion

Diarrhoea outbreaks dropped by at least 50% by increasing the inclusion of crystalline AA by 30% compared with the "Ideal-protein" regardless of the protein concentration and is comparable with the effect of using pharmaceutical levels of zinc oxide (2,500 ppm), documented in other studies. Productivity peaked between 20.6% and 21.8% CP at respectively 113% to 131% SID Lysine:Leucine

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