Variability in The Total and Reactive Lysine Content of Soybean Meal

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During heat processing and prolonged storage of feedstuffs, the ε-amino group of lysine can react with other compounds, specifically reducing sugars, and form biologically unavailable lysine derivatives (eg. fructoselysine). This form of lysine is known to be unavailable for body protein deposition and is excreted largely in the form of urinary nitrogen even though this form of lysine can be absorbed through the small intestinal epithelium (van Barneveld *et al.*, 1995). However, some of this unreactive lysine can revert to lysine through the process of acid hydrolysis during conventional amino acid analysis, which causes inaccuracy in the quantification of biologically available lysine content (Rutherfurd and Moughan, 2007). Only the lysine with a free ε-NH_3 group is considered as biologically available lysine for body protein deposition (Rutherfurd and Moughan, 2007). Soybean meal is a common amino acid source in pig diets and there is a need to quantify the variation in total and reactive lysine content for the Australian pig industry to improve the precision of diet formulation, utilisation efficiency of amino acids and hence production efficiency of Australian pork per unit of nutrient fed. The hypothesis tested in this study was that reactive lysine can not be accurately predicted from total lysine content in soybean meal.

A total of 209 soybean meal samples from the major soybean meal producing countries such as USA, Brazil, Argentina, China and India were collected over 12 months. Samples were immediately stored at 4°C and analysed for total and reactive lysine content using the method described in Rutherfurd and Moughan (2007). For reactive lysine content, the within batch and between batch variations (coefficient of variation) were less than 5 % and 10%, respectively. Data were analysed using a regression analysis.

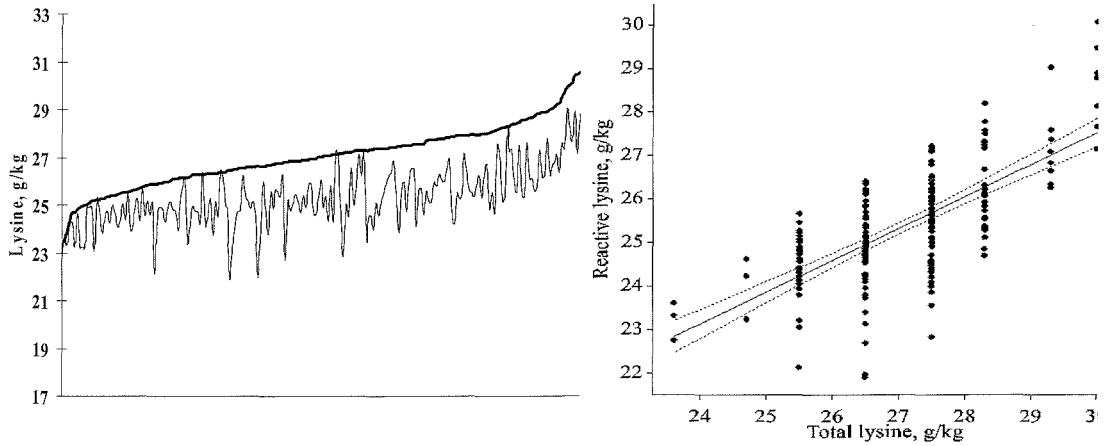

Figure 1. *Variation in (a) reactive lysine content (* ▬ *total lysine,— reactive lysine) and (b) relationship between total and reactive lysine with a 95% confidence interval.*

The results demonstrate that absolute reactive lysine content varied by 27% (ranged from 21.9 to 30.1 g/kg SBM) and the reactive/total lysine ratio varied by 17% (Figure 1). A significant relationship between total and reactive lysine was observed (R^2 = 0.52, P < 0.001) indicating that the amount of heat damaged lysine was partly dependent on the total amount of lysine in a soybean meal. However, weak predictability of reactive lysine from total lysine (R^2 = 0.52) highlights the importance of developing rapid screening tools such as near infra-red reflectance (NIR) calibrations for quantitative screening of protein quality in soybean meal.

RUTHERFURD, S.M. and MOUGHAN, P.J. (1997). Nutrition Research Reviews. **20**: 3-16.

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