OPTIMUM CONDITIONS FOR GUANIDINATION OF LYSINE IN COTTONSEED MEAL

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Dietary proteins labelled with homoarginine can be used to measure endogenous amino acid losses in mammals and birds (Hagemeister and Erbersdobler 1985; Siriwan et al. 1994). Labelling is achieved by guanidination wherein the lysine residues in dietary proteins are converted to homoarginine through reaction with o-methylisourea (MIU) in an alkaline medium. The extent of conversion however, varies widely among feedstuffs - from virtually complete conversion in gelatin (Rutherford and Moughan 1990) to 37% in cottonseed meal (Siriwan et al. 1994). It appears that the optimal reaction conditions in terms of incubation time, lysine:MIU ratio and pH have to be established for each dietary protein to achieve maximum conversion rates. In the present study, this question was addressed in relation to cottonseed-meal protein. Incubation times evaluated ranged from 24-144 hrs with samplings at 24-hr intervals. Lysine:MIU ratios varied from 1:8 to 1:32, and the pH from 9.5 to 12.0. Standard reaction conditions, except for the variables evaluated, were employed in each of three laboratory experiments.

The results indicated that the conversion of lysine to homoarginine increased markedly between 24 (29% conversion) and 48 (43% conversion) hours of incubation. The guanidination reaction was essentially complete after 72 h of incubation (46% conversion), with little improvement with longer incubation times. A lysine: MIU ratio of 1:12 was found sufficient for maximum conversion to homoarginine in cottonseed-meal protein. The conversion rates increased with increasing pH, with maximum values being observed at pH 12.0 (48% conversion). The overall results suggest that a homoarginine labelling of 48% may be achieved by incubating the cottonseed meal with 0.4M MIU at a lysine:MIU ratio of 1:12 and pH 12.0 for 48 hours. The moderate conversion rates determined for the cottonseed meal protein, compared to the high values reported for homogenous proteins such as caesin and gelatin, is probably reflective of the inaccessibility of some lysine residues closely associated with other polymeric components, particularly gossypol and carbohydrates, within the meal.

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