PROJECT

EVALUATION AND STANDARDISATION OF METHODS FOR DETERMINING THE DEGREE OF SOYA PROCESSING

FINAL REPORT

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1. Introduction

It is universally accepted that the contribution made by dietary protein to the nutritional needs of the animal depends not only on its amino acid composition, but also on how effectively these amino acids are utilised. The use of full fat soya beans (FFSB) in animal feeds has been limited due to the uncertainty of the exact availability of the amino acids. This arises both due to the presence of biologically active substances with an anti-nutrient action, which are contained in raw FFSB, as well as the effect that processing has on the availability of the amino acids contained therein. Processing of the raw FFSB by means of heat and mechanical treatment destroys the anti-nutrients, thus making them fit for use in diets. The problem relating to the availability of the amino acids in the heat treated beans arises due to the fact that only an optimum level of heat treatment will produce maximal availability of the amino acids to the animal. Under-processing of the FFSB limits amino acid availability due to only partial destruction of the anti-nutrient factors. Over-processing, on the other hand, decreases amino acid availability as a result of the Maillard reaction that occurs between sugar aldehyde groups and free amino groups (Stern, 1989).

2. Problem description

The provision of amino acids, either free or as protein, contributes a substantial amount to the cost of animal feedstuffs. The objective of any nutritionist is therefore to formulate diets that will provide the correct amounts of nutrients required by the animal at the lowest possible cost. This implies that dietary formulations need to be on an available amino acid basis in order to optimise the dietary amino acid levels, thereby minimizing cost. As a result of the effect of processing on the amino acid availability of full fat soybeans, nutritionists using FFSB in diets have been forced to compensate for the possibility of reduced amino acid availability by over-formulating diets on a total amino acid level. It is therefore increasingly being recognised that, if the full potential of FFSB for use in diets is to be realised, reliable analytical technique(s) need(s) to be available for quality control of processed FFSB, which would enable feed manufacturers to determine the exact degree of processing of the soya beans. The results of this would in turn provide an estimate of the availability of the amino acids contained in the FFSB for use in feed formulations.

It has been clearly illustrated (Davies, 1998; Palic, 2004) that the results of analysis of the same sample of FFSB on the content of anti-nutrients obtained by currently available analytical techniques vary widely between laboratories, causing uncertainty and confusion among soya processors, feed manufacturers and end-users.

3. Anti-nutrients in raw soya beans

The nutritive value and protein digestibility of raw soybeans in monogastric animals is generally poor, due to the presence of anti-nutrients, the most important being the proteases (trypsin and chymotrypsin) inhibitors and haemagglutinins/lectins. In addition, urease, saponins and allergenic factors (Monary, 1989a) may also be present. Anti-nutritional factors, proteases and haemagglutinins/lectins are heat labile and their contents in raw soybeans may be significantly reduced by adequate heat processing.