

EFFECTS OF EXPANDER AND EXPANDER-PELLETING ON THE EXTENT OF PROTEIN DENATURATION IN PEAS, LUPINS AND FABA BEANS USING DIFFERENTIAL SCANNING CALORIMETRY

Arash Azarfar

Lorestan University, Faculty of Agriculture, PO Box 465, Khorramabad, Iran Arash.Azarfar@gmail.com

INTRODUCTION

An experiment was carried out to establish whether using a pre-compacting device (expander) changes the extent of protein denaturation in peas, lupins and faba beans using differential scanning calorimetry (DSC). The technique provides the temperature of denaturation (T_p) and the enthalpy change associated with the transition (δH).

MATERIALS AND METHODS

Feed samples were taken before and after expander processing (E) and after pelleting (EP). Product temperature determined using thermocouples in the last mixing bolts before the exit of expander, were 105 °C, 110 °C and 106 °C for peas, lupins and faba beans, respectively. Pelleting was carried out with a 5 × 45 mm die (bore × hole), using a V2-30 pelletizer. Identical samples of original mashes (hammer mill; 3 mm sieve) and all the processed materials (E and EP) were ground through a 3 mm sieve. Denaturation enthalpy (δH) of the samples was determined by differential scanning calorimetry (DSC) in duplicate, using a Mettler-Toledo DSC12-E.

Analyses of variance for the DSC parameters were done using following model:

$$Y = \mu + P_i + \varepsilon_{ij}$$

where Y is the dependent variable under examination, μ is the overall mean, P_i is the processing effect and ε_{ij} is the error term.

RESULTS AND DISCUSSION

In peas, E decreased δH (1.2 vs. 0.3 J/g dry matter in unprocessed and E peas, respectively; $P < 0.05$). However, ensuing pelleting did not have any significant effects on the parameter mentioned ($P > 0.05$). In lupins, neither E nor EP had any significant effects on δH ($P > 0.05$). In faba beans, E had significant effects on δH (1.2 vs. 0.3 J/g dry matter in unprocessed and E peas, respectively; $P < 0.05$), and that the followed pelleting did not have significant effects on δH .

Goelema (1999) found that as DSC denaturation enthalpy decreases, the rumen undegraded protein (DUP) increases. For peas and faba beans δH declined after expander processing. Therefore, in peas and faba beans expander processing may increase the flow of DUP in dairy cows and therefore has the potential to change the site of protein digestion in dairy cows.

Keywords: expander; expander-pelleting; differential scanning calorimetry

REFERENCES

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