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OPTIMISATION OF TRANSGLUTAMINASE AS A COLD SET BINDER IN LOW-SALT BEEF AND POULTRY COMMINUTED MEAT PRODUCTS USING RESPONSE SURFACE METHODOLOGY

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Background

Mechanical disruption (i.e. chopping) or working (i.e. massaging) of meat tissue facilitates in the extraction of functional myofibrillar protein. Addition of salts (i.e. sodium chloride) further increases this rate of myofibrillar (salt soluble) protein extraction and it is the gelation of this fraction on heating which binds meat pieces together (Kerry *et al.*, 1999). Where a reduction/removal of salts in processed meats is desired, cold set binders such as sodium alginate or blood proteins may be employed (Kerry *et al.*, 1998). Transglutaminase (Tgase) has also recently been reported as a cold set meat binder and acts by crosslinking meat proteins. Moreover, Tgase may also be employed successfully as a meat binder in the absence of salts by combining with suitable food proteins (Kuraishi *et al.*, 1997). The objective of this study was therefore, to optimise using response surface methodology, the binding capacity of Tgase in the absence of salt (sodium chloride) using non-meat proteins (soya isolate, sodium caseinate and whey protein concentrate (WPC)) in beef and poultry restructured products. Meat products were evaluated in terms of cook losses, water holding capacity and mechanical textural properties.

Materials and Methods

Fresh poultry breast and beef topside obtained 24 h *post mortem* were minced separately through a 4mm plate, divided into 12 (1kg) batches, vacuum packed and held at -20°C until required for processing. Tgase and test non-meat proteins (soya isolate, sodium caseinate or WPC) were added to the restructured products as suggested by the response surface design. All products were prepared using a Stephan 1 l mixer. Meat together with the Tgase and non-meat protein were initially chopped (1.5min x 4,000rpm). Water was then added and the mix chopped for a further 1.5min at 4,000rpm. Treatments were then formed into patties (100g) or canned (400 ml). All samples were tested as raw and cooked products, with raw products being evaluated after 24 and 48 h. Patties were fried using an electric frying pan (120°C x 15min) with cans being heat-treated using a steam oven (80°C x 2 h) or retorted (121°C x 15 min). Cooked products were stored at 4°C x 16 h prior to testing. Texture profile analysis was completed using an SMS texture analyser set in compression mode and fitted with a 5kg load cell. All compression testing was conducted at 4°C. Cooked samples were further assessed for cook losses, water holding and colour (Hunter L, a, b values).

Results and Discussion

RSM data for cooked patties (% cook loss and hardness data) showed that soya isolate was an effective protein substrate when compared to sodium caseinate in terms of % cook losses and meat bind in both cooked beef and poultry patties (Figures 1 and 2). Moreover, hardness values for test patties containing Tgase were significantly ($p < 0.01$) higher when compared to controls containing salt (2%) and phosphate (0.25%). Cook loss values for treatments were similar to the controls with water binding capacity (WBC) values in agreement with cook loss data. Results further demonstrated that the type of WPC used (i.e. native versus denatured protein) determined how functional the protein was, with denatured protein being a more active source. Tgase activity was more effective in poultry meat than beef over the formulation range assessed especially in terms of product texture (Figure 2). Results also showed that cook losses were significantly ($p < 0.01$) reduced as non-meat protein addition ratio increased, however increasing Tgase levels did not have the same effect. Addition of non-meat proteins at higher concentrations significantly ($p < 0.01$) decreased Hunter 'a' values.

Conclusions

RSM trials showed that Tgase in combination with non-meat proteins could be used successfully in beef and poultry patties in direct replacement for sodium chloride and tripolyphosphate salts. Ranking of non-meat protein efficiency in combination with Tgase showed that soya ≥ sodium caseinate > WPC. Results also showed that addition of non-meat proteins to beef and especially poultry meat systems significantly ($p < 0.01$) reduced cook losses and increased water holding capacity values.

References

Kerry, J.F.; Stack, F. and Buckley, D.J. 1999 The rheological properties of exudates from cured porcine muscle: effects of added non-meat proteins *J Sci Food Agric* **79,** 101-106; Kerry, J.F., Kerry, J.P., O'Donnell, A, O'Riordain, B., Buckley, D.J. and Jolley, P.D. 44th ICoMST Barcelona Spain Vol I 412; Kuraishi, C.; Sakamoto, K.; Yamazaki, K.; Susa, Y.; Kuhara, C.; and Soeda, T. (1997) Production of restructured meat using microbial transglutaminase without salt or cooking. *Journal of Food Science* **62,** 488 - 490; 515.

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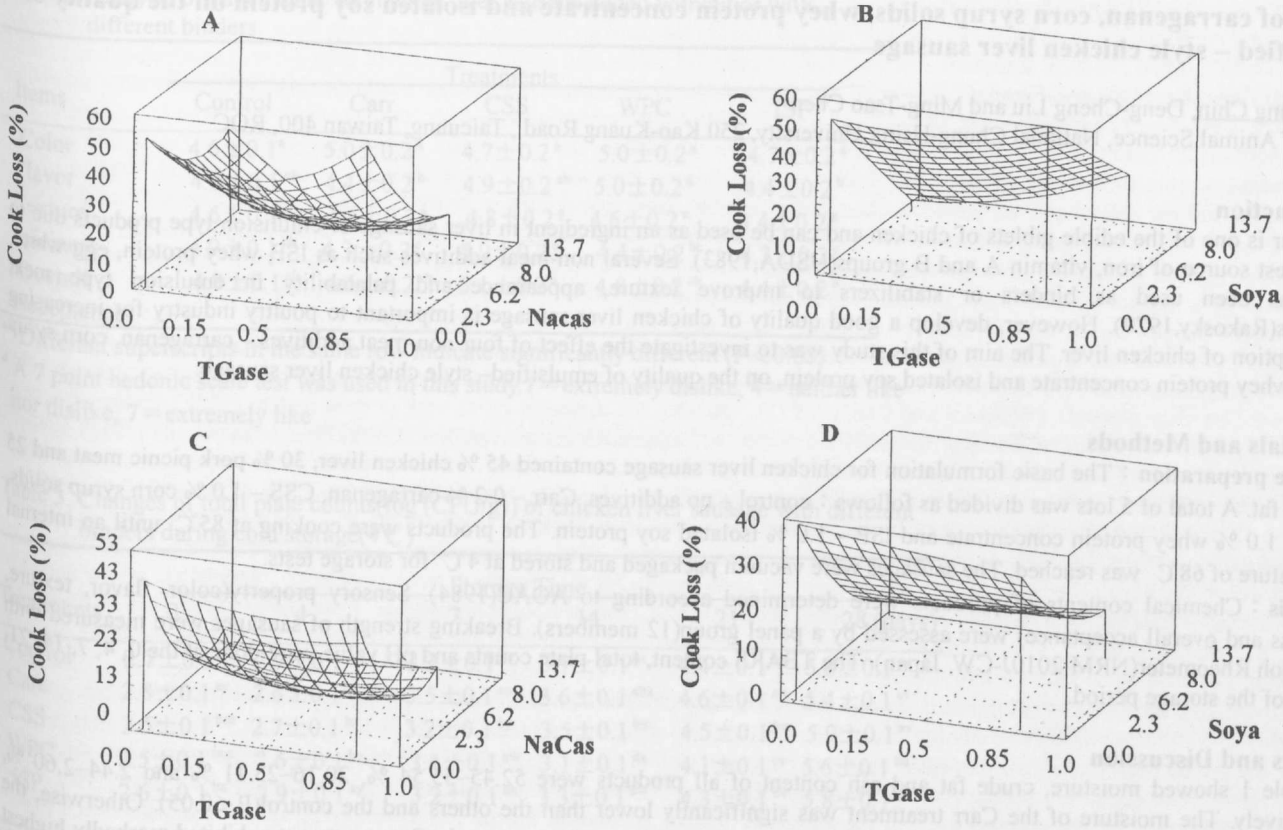

Figure 1 Effect of transglutaminase (Tgase) in combination with either soya isolate (soya) or sodium caseinate (Ncas) non-meat proteins substrates on % cook losses in beef (A and B) and poultry (C and D) patties.

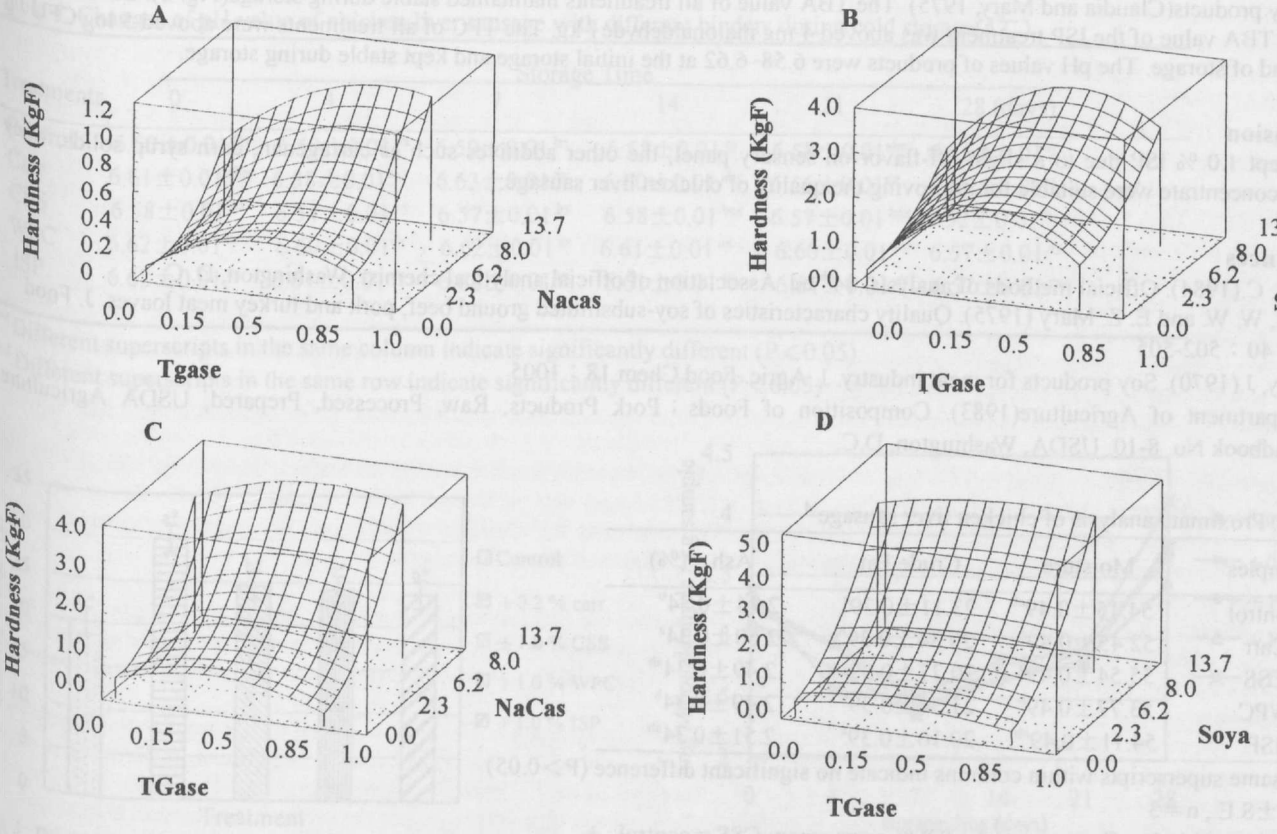

Figure 2 Effect of transglutaminase (Tgase) in combination with either soya isolate (soya) or sodium caseinate (Ncas) non-meat proteins substrates on product hardness (Kg Force) in beef (A and B) and poultry (C and D) patties.