PHYSICAL PROPERTIES AND SENSORY QUALITY OF *BIFES A LA CRIOLLA* MEAL PREPARED USING *SOUS VIDE* SYSTEM

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Background

Sous vide processing is the application of a cooking-pasteurization heat process to food products in a hermetically sealed vacuum pouch or tray. Advantages associated with *sous vide* processing include a superior flavour profile to conventionally prepared food, increased tenderness and moisture, improved colour retention and reduced nutritional loss. Furthermore, processing and storage in evacuated pouch increase product shelf life by inhibiting microbiological and chemical spoilage (Vaudagna *et al.*, 2002). Possible users include commercial and institutional caterers, food retailers, hotels and restaurants, transport systems, etc. The current consumption of *sous vide* product in Argentina is almost unsignificant. According to this, in the recent years, some studies have been carried out in order to develop *sous vide* ready-to-eat meals. The formulation of these products was based on typical Argentinean recipes. As a example, we present in this communication, the successful results obtained with the *Bifes a la Criolla* meal. According to the typical style, this meal is prepared by cooking beef steaks, vegetables (tomato, onion, green pepper and garlic) and seasoning into a pot.

Objective

To evaluate the effect of different heat treatment combinations (65°C – 9 min and 70°C – 2 min) on the physical properties and sensory quality of *Bifes a la Criolla* meal prepared using *sous vide* system .

Methods

Portions (700 g) were prepared as follow: two marinated beef steaks (1 g NaCl/100 g fresh tissue; *semimenbranosus* muscle) and pre-cooked sauce (tomato, onion, green pepper, garlic, seasoning and xanthan gum) were vacuum packaged in plastic laminate pouches (Cryovac, CN 510, Sealed Air Co, Argentina) in a sauce to portion ratio of 28 (% w/w) . Then, the packaged portions were cooked-pasteurized in a water cascading retort (Microflow Barriquand, Roanne, France). In the present work, two different processing temperature and time combinations were applied at the slowest heating point (SHP) of the beef steaks, i.e., 65°- 9 min and 70°C - 2min. Both combinations have been suggested in order to achieve a 6D reduction of *Listeria monocytogenes* (FAIR CT96-1020, 1997). Immediately after heat treatment, samples were immersed in an ice-water bath until the temperature at SHP reached 10 °C. Then, samples were stored at (1.0±0.5) °C for 24 h until the physicochemical (sauce and beef pH, sauce to portion ratio, sauce instrumental colour and beef instrumental tenderness) and the sensorial analysis (product colour and appearance) were performed.

Results and Discussion

Figure 1 shows the sauce to portion ratio (% w/w) corresponding to the heat treatments applied in the present work (65 °C – 9 min and 70°C – 2 min). It can be observed a ratio significantly higher ($p < 0.05$) for treatment 70 °C – 2 min than for treatment 65 °C – 9 min. Moreover, both treatments produced a significant increment ($p < 0.05$) of this parameter respect to the ratio of uncooked portions (28 % w/w). Beef pH values corresponding to *sous vide* prepared portions were not different ($p > 0.05$) to raw beef pH values (data not shown). Precooked sauce presented a pH value significantly lower ($p < 0.05$) than the sauce pH values of *sous vide* prepared portions; however, was not observed a significant heat treatment effect ($p > 0.05$) upon sauce pH values (Figure 2). Processed portions presented higher sauce to portion ratio and sauce pH values as consequence of the juice lost from beef steaks during *sous vide* processing.

Table 1 presents the Warner Bratzler (W.B.) shear force values of beef steakes corresponding to portions processed at 65 °C – 9 min and 70 °C – 2 min. As it can be seen, beef instrumental tenderness were not significantly affected ($p > 0.05$) by those heat treatments combinations. According to a correlation of W.B. values with a hedonic scale, values of about 0.50 kg cm^{-2} corresponding to a tender beef.

Results of sauce instrumental colour (CIELab system) indicated that *sous vide* treated sauce outcome in less red and yellow than those prepared according to typical style. Among heat treatment applied in the present work, sauce with significant higher L* values was obtained at 70 °C – 2 min. Assessors evaluated sensory colour and appearance of *sous vide* prepared portions using triangular tests. These tests were designed to compare heat treatment (65 °C – 9 min and 70 °C – 2 min) effect on product colour and apareance. In addition, assessors generated and evaluated colour and appearance descriptors (global colour intensity, GCI; global red colour intensity, RCI; global brown colour intensity, BCI; steak colour intensity, SeCI; sauce colour intensity, SaCI; sauce appearance, SaA; sauce consistency, SaC; global appareance of portions, GAP) According to results of triangular tests, portions subjected to 65 °C – 9 min were significantly different ($p < 0.05$) to those treated at 70 °C – 2 min). This difference was supported by the results of the descriptors evaluation (Figure 3); descriptors GCI, RCI, SaCI, SaA and GAP of portions treated at 65 °C – 9 min resulted significantly higher ($p < 0.05$) than those descriptors corresponding to portions processed at 70 °C – 2 min.

Conclusions

Bifes a la criolla meal was successfuly prepared using *sous vide* system. *Sous vide* prepared portions showed higher sauce to portion ratio and sauce pH values than uncooked portions as consequence of the juice lost from beef steaks during *sous vide* processing. Heat treatment combinations had a significant effect upon sauce to portion ratio and sensory attributes (portion colour and appearance). Portions treated at 65°C – 9 min presented the highest attribute scores, consequently, it appears that this treatment can be the best choise.

Acknowledgements

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TABLE 1: Warner Bratzler shear force values of beef steakes corresponding to *Bifes a la Criolla* prepared using *sous vide* system

Treatment	Mean (kg cm^{-2})	S.D. (kg cm^{-2})	C. V. (%)
65 °C – 9 min	0.52 a	0.15	28.50
70 °C – 2 min	0.48 a	0.11	22.45

Means in the same column that bear different letters are significantly different ($p < 0.05$)

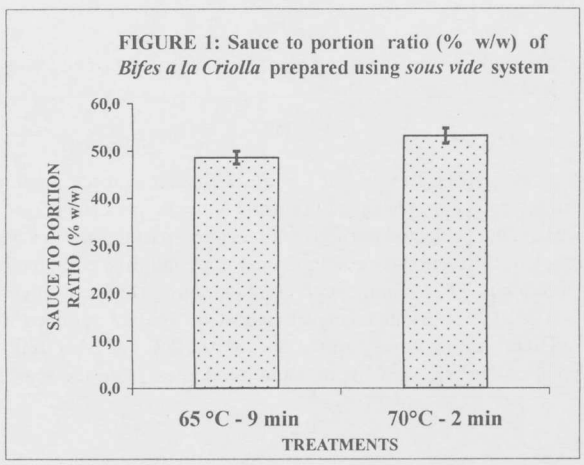

FIGURE 1: Sauce to portion ratio (% w/w) of *Bifes a la Criolla* prepared using *sous vide* system

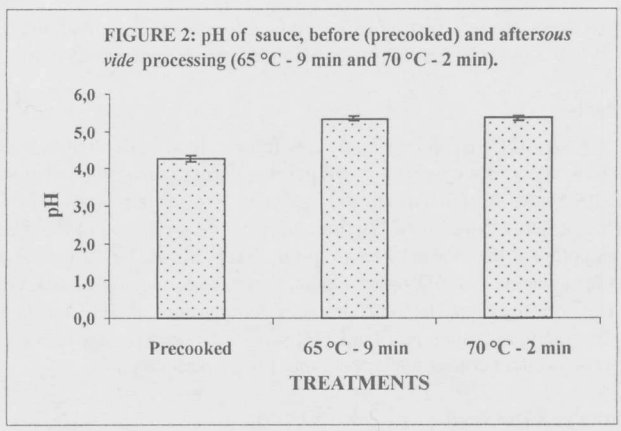

FIGURE 2: pH of sauce, before (precooked) and after *sous vide* processing (65 °C - 9 min and 70 °C - 2 min).

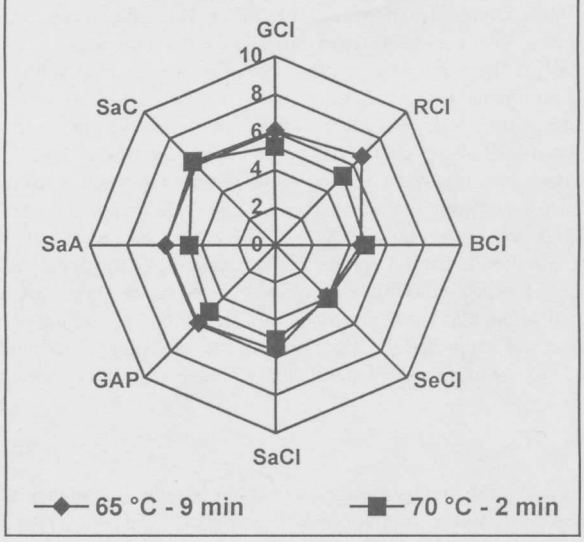

FIGURE 3: Radial plot corresponding to sensory colour descriptors of *Bifes a la Criolla* prepared using *sous vide* system