HOT-PROCESSING OF PORK: A COMPARISON OF THE MICROBIOLOGICAL STABILITY, PROCESS YIELD AND SENSORY ANALYSIS BETWEEN HOT- AND COLD-PROCESSED VIENNAS

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INTRODUCTION: Why has the hot-boning process gained international interest during the past decade? The answer lies economics. Renewed interest has been fostered by the economic advantages, including savings in energy, space, lab materials and product weight loss, as well as improved functional properties (Cuthbertson, 1980; Kastner, 1982). Fur advantages include improved sanitation and shelf-life, water-holding and -binding capacity, emulsifying properties and m yields, a decreased cooking loss and excellent sensory characteristics (Olsen, 1983; Kastner, 1982; Hamm, 1982). A leading meat company in South Africa initiated this study to quantify the advantages of the hot-processing of pork over conventional method. The objective was to compare viennas prepared from *pre-* versus *post-rigor* controls regar microbiological stability, processing yield and sensory analysis. Results obtained could be of considerable economic commercial value to the processed meat industry in Southern Africa, as it can be anticipated that hot-processing will incre throughput as well as the quality of emulsion-type products.

MATERIALS AND METHODS: Twelve pigs (gilts weighing 90 - 98 kg), after being transported for ca 10 km, were reste two hours before they were slaughtered. The pigs were electrically stunned (220 V for 7 sec.), bled immediately by seve the jugular vein, scalded and dressed according to normal practice. The carcasses were halved lengthwise, with the left s of the carcass being used for hot-processing (HP) (processed within two hours after stunning) and the right side cold-proces (CP) (processed after chilled for 24 hours at 0 - 3 °C). The shoulders were removed between the 3rd and 4th thoracic verteb boned, derinded, defatted and used to formulate the pre-blends. The pre-blends consisted of 75 % pork (90:10), 2 % s 0,05 % nitrite, 0,30 % ascorbate, 0,30 % phoshate blend (ABASTOL 305, pH 8,8) and 22 % water/ice. The viennas w formulated according to the following composition: 34 % pre-blend, 22 % pork fat (10:90), 1,36 % salt, 5 % isolated so protein (ISP), 0,60 % spice (customised spice pack), 0,60 % dextrose, 3,50 % potato starch and 32,96 % ice. The emuls was filled into 21/70 Nojax ('peel-off') casings. The viennas were smoked for 35 min and cooked to an internal temperat of 72 °C in a Fessmann Turbomat T 1900 / T 1950 smokehouse.

Microbiology - The total plate count (TPC), Enterobacteriaceae, yeasts and lactic acid bacteria were determined on the HP a CP viennas, using the methods described by Nottingham *et al.* (1975); Sakazaki *et al.* (1960); Koburger (1976) and De Man *al.* (1960).
Processing yield - The cooking loss of the viennas was determined by weighing the sample before and after cooking and th calculated as a percentage of the original sample weight.
Sensory analysis - The ten-member trained sensory panel, specifically trained to evaluate viennas, used a 'Difference from con test' (Meilgaard *et al.*, 1990). The samples were served hot (heated at 160 °C for 12 min) to the panellists on heat sandbaths. Two sensory sessions were held per day between 09h00 and 10h00, with four to five samples, including the bli control, per session. Samples were presented in a completely random order. Evaluations were performed in well ventilate temperature controlled, partitioned booths under red light conditions. Water at room temperature was provided to the panellis to cleanse the palate between samples.
Shear force resistance measurements - An Instron Universal Testing Machine Model 4301 fitted with a Warner-Bratzler she attachment and a crosshead speed of 400 mm/min were used. The viennas with a diameter of 17 mm each, were at ambi temperature. Each vienna was sheared perpendicular to the length of the vienna (3 replications).
Statistical analysis - The data were analyzed by means of a multi-factorial analysis of variance. Analysis and interpretation the main effects were sufficient to substantiate whether or not hot-processing is a worthwhile alternative in the production emulsion meat products. Significant main effects were accepted at the 5 % level of probability and the main values w separated by the LSD multiple range test.

RESULTS AND DISCUSSION: There was no significant difference ($p > 0,05$) in the microbial counts as influenced by the bon method. Boning method also had no significant ($p > 0,05$) influence on the smokehouse yield. This is in agreement with th findings of Choi *et al.* (1987). In the South African industry emulsion-type products are extended by adding non-meat prote (ISP) and starch. These extenders and the added phosphate could have masked the advantage which the *pre-rigor* meat mig have had on the final yield (Dibble, 1994; Puolanne & Turkki, 1983).

The aroma and flavour of the CP viennas was more ($p < 0,05$) intense than that of the HP samples (Table 1). The viennas were smoked and cooked in a smokehouse which could have led to a variation in the degree of smoking. Hot-boning normally does not adversely affect meat flavour (Schmidt & Keman, 1974; Lin *et al.*, 1979; Jeremiah *et al.*, 1993). The texture of the CP viennas was significantly ($p < 0,05$) firmer than that of the HP viennas (Table 1). The same significant difference in firmness was found with the compression test. The correlation between sensory firmness and shear force values was significant ($p < 0,05$; $r = 0,59$). The addition of phosphate to the pre-blend might have influenced the textural firmness of the viennas (Puolanne & Terrell, 1983; Gariépy *et al.*, 1994). Choi *et al.* (1987) found that the addition of phosphate (0,50 %) slightly increased the overall firmness values more frequently in CP frankfurters than in HP samples. HP resulted in an end-product with better juiciness (Table 1). Juiciness is related to the water-holding capacity of muscle and this could explain the higher value ($p < 0,05$) for juiciness in the HP viennas (Lin *et al.*, 1979).

Table 1: The means of the sensory characteristics and the shear force resistance measurements of viennas as influenced by hot-processing compared to cold-processing

Boning method	Aroma	Texture	Juiciness	Flavour	Shear force resistance (N)
Hot-boned	$4{,}65^a \pm 0{,}06$	$4{,}57^a \pm 0{,}04$	$5{,}09^a \pm 0{,}04$	$4{,}85^a \pm 0{,}05$	$12{,}50^a \pm 0{,}40$
Cold-boned	$5{,}34^b \pm 0{,}06$	$5{,}19^b \pm 0{,}05$	$4{,}79^b \pm 0{,}04$	$5{,}58^b \pm 0{,}06$	$14{,}12^b \pm 0{,}42$

Mean values ± standard error
[a,b] Values within the same column, with different superscripts, differ significantly ($p < 0,05$)
Scores: 9 = Extremely more, 5 = Same as control, 1 = Extremely less

CONCLUSIONS: Results of this research indicated that HP does not adversely affect the microbial quality of emulsion-type end-products. The use of phosphates in the *pre-rigor* pre-blends proved to be unnecessary, since there was no yield advantage with the application of phosphates. The HP viennas did not prove to be of an inferior quality compared with the CP viennas in terms of sensory characteristics. Although there was no advantage in cooking yield from HP, the other economic advantages overwhelmingly favour the utilization of *pre-rigor* meat in meat processing.

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