

# THE EFFECT OF STARTER CULTURES AND FERMENTATION TIMES ON THE PROCESSING AND SENSORY PROPERTIES OF CURED BEEF PREPARED FROM FOREQUARTER MUSCLES

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## Introduction

The flavour of cured meat products is governed by curing ingredients, such as salt, nitrite and spices but also, by the processes to which they are subjected e.g. smoking. Additionally, the microbial decomposition of carbohydrates, lipids and proteins contributes to several flavour components. The fermentation process, i.e. the anaerobic breakdown of carbohydrates by non-pathogenic micro-organisms to yield various alcohols and organic acids can preserve or enhance the organoleptic characteristics of meat products (Campbell-Platt & Cook, 1995). The addition of starter cultures is common practice in the meat fermentation industry, so as to increase the uniformity of batches. The most commonly used bacterial species are Lactic acid bacteria (LAB) and *Micrococccaceae* (Houde *et al.*, 1998). These are designed to give products a novel flavour profile by acidification and related changes in the meat. The objective of this study is to determine the effects of two different starter cultures and two different fermentation times (4 hours and 10 hours) in enhancing flavour development in a full-moisture cured beef product.

## Materials and Methods

Silverside flat cuts (*M. biceps femoris*) were sourced from a local meat producer. The starter cultures used were a commercial single strain culture containing *Staphylococcus carnosus* and a mixed culture containing *Staphylococcus carnosus*, *Staphylococcus xylosus* and *Lactobacillus sakei*, obtained from Christian Hansen GmbH. Brine solutions containing the single strain culture (SC1) and the mixed strain (SC2), were prepared. The boneless cuts were pumped to 115% of their green weight with brine and tumbled for 2 hours at 10 rpm. Tumbled muscles were then enclosed in elastic netting and vacuum packed. The fermentation stage was carried out in a steam-air oven using at 30°C and 95% relative humidity (RH), for 4 or 10 hours after which time the products were cooked to a core temperature of 72°C. Cooked samples were analysed for moisture, fat and protein content (Bostian *et al.*, 1985; Sweeney and Rexford, 1987). Cook loss and yield were calculated. Texture Profile Analysis (TPA) was carried out using Instron model 5543. An 8-member trained panel was employed to evaluate sensory quality of sample treatments (AMSA, 1995). Results were analysed using a two-way analysis of variance (ANOVA).

## Results and Discussion

Brine composition had a small effect ( $P \leq 0.05$ ) on moisture, with cured beef produced from brine containing SC1 yielding a drier product than the control. This result corresponds with yield measurements that showed products made from brines containing SC1 having greater cook losses ( $P \leq 0.05$ ) and therefore, poorer final yields ( $P \leq 0.01$ ). The SC1 product also had a lower ( $P \leq 0.05$ ) salt content. However, these differences were not reflected in sensory panel scoring, which showed no effect on juiciness and saltiness ( $P \geq 0.05$ ). Taste panellists preferred ( $P \leq 0.05$ ) SC1 samples to those produced with SC2, but neither was rated as different to the control (Table 1).

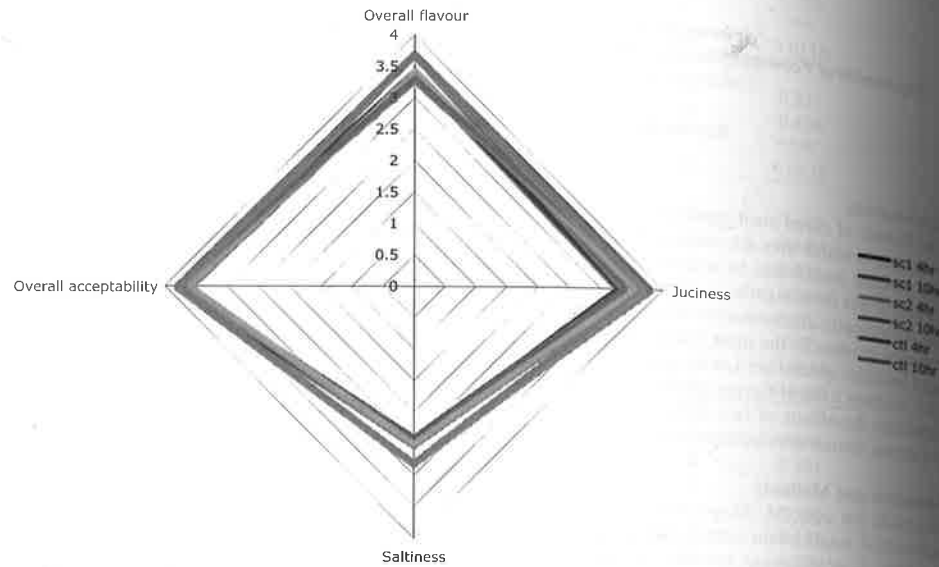
**Table 1:** Effect of brine formula on overall flavour and preference in cured beef.

Treatment	Overall flavour	Preference
Starter culture 1	3.6 <sup>a</sup>	0.3 <sup>a</sup>
Starter culture 2	3.3 <sup>a</sup>	0.1 <sup>b</sup>
Control	3.6 <sup>a</sup>	0.3 <sup>a</sup>

<sup>a-b</sup> Means in the same column with different letters are different ( $P \leq 0.05$ )

Brine composition affected many of the TPA attributes, with the product from SC1 being harder ( $P \leq 0.01$ ), more cohesive ( $P \leq 0.05$ ), gummier ( $P \leq 0.001$ ) and chewier ( $P \leq 0.01$ ) than the control. Despite this apparent detrimental effect on texture, the sensory panel score for overall acceptability of the product was unaffected ( $P \geq 0.05$ ). Colour and pH values were not affected ( $P \geq 0.05$ ) by brine formula or fermentation time. Unlike SC1 product, chemical analysis of the SC2 product showed that brine formula and fermentation time had no effect ( $P \geq 0.05$ ) on moisture. However,

fermentation time affected cook loss ( $P \leq 0.01$ ) and yield ( $P \leq 0.001$ ) with the 10 hour fermentation period resulting in less cook loss and better yields. Furthermore, sensory analysis showed no effects ( $P \geq 0.05$ ) for brine formula and fermentation time on overall flavour, juiciness, saltiness and overall acceptability (Figure 1). Texture and colour were unaffected ( $P \geq 0.05$ ) by brine formula and fermentation time.



**Figure 1:** Effect of brine formula and fermentation time on the sensory aspects of cured beef products.

#### Conclusions

The results indicate that the addition of starter cultures, single or mixed, did not give an improvement in flavour in the processed products. Although the addition of the single starter culture did not have detrimental effect on flavour, the control product was preferred by taste panellists to that made with the mixed culture. Further research would be required to investigate the application of starter cultures in full moisture products and to determine a flavour profile that would specifically suit the Irish consumer.

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