OVERVIEW OF READY-TO-EAT OSTRICH MEAT PREPARATION METHOD WITHOUT DECOMPOSITION OF CONSTITUENTS

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Abstract

Ostrich commercial rearing is new in Latvia agriculture. The first several ostriches were introduced in Latvia ten years ago. Presently the largest ostrich's farms are located in east part of Latvia, mainly in region of Jekabpils. The task of this study was to start with batching of the information on several methods of ostrich ready-to-eat making and secondly – to develop *sous vide* mild cooking method with the aim to apply it for ostrich meat ready-to-eat preparation with better quality and prolonged shelf life. The information in the scientific literature as well as in website proved that *sous vide* cooking technology for the time being has not been applied for ostrich meat ready-to-eat preparation. Bullocks' tenderloin purchased at the local market as cheaper and more similar to ostrich meat was chosen to specify the preliminary experiments. In our experiments has been found that *Sous vide* thermal treatment improved the microbial stability of bullocks' tenderloin during 20 days storage at +4.0±0.5 °C.

Key words: ostrich meat, *Sous vides* pasteurisation.

Introduction

Ostrich commercial rearing is new in Latvia agriculture. The first several ostriches were introduced in Latvia ten years ago. Presently the largest ostrich's farms are located in east part of Latvia, mainly in region of Jekabpils (Horbacuks, 2005; Zdanovska, 2005). Ostrich meat is lean, tasty and healthy a highly nutritious red meat of the future. The global demand for ostrich meat has escalated with the international trend towards healthier eating, as it is virtually fat free and low in calories and cholesterol but very rich in protein. The ostrich meat is low in cholesterol (just 0.062 g per 100 g meat), low in fat (less than 0.2%), low in Joules (387000 J per 100 g of meat), reach in protein (20.5%), iron (3.2 mg per 100 g meat) and, absolutely reach in taste. The world's foremost supplier of quality ostrich meat in South Africa and internationally Klein Karoo offers to the wholesale trade and to consumers a wide range of raw semi-manufactured ostrich meat. Their range includes prime fillet, steak, goulash, mince, sausages, kebabs, marinated ostrich products, spice sprinkled ostrich meat products, smoked fillet and a variety of cold deli meats Cuts are vacuum sealed in bags of 500 g in each pack before being packaged. Meat is exported fresh, frozen as well as pre-cooked to accommodate out-of-season demand (Karoo). Klein Karoo ostrich meat is ideal choice for the weight conscious. Sportsmen, sportswomen and people with an active lifestyle benefit greatly from the high ostrich meat iron content. The low fat content of ostrich meat results in slightly drier meat. Salt and seasoning draws moisture therefore the meat could be seasoned after sealing. The perfect ostrich fillets or steak is pink to rare, moist and tender. Ostrich meat will become dry if overcooked or well done (Karoo). As a new industry there is a lack of supporting data as it relates to ostrich, but the principles are the same as for other comparable mainstream meat specie (Khalifa). Ostrich "ham" and a control pork ham product were prepared by a traditional ham cure, and Polish sausage products were formulated with either all-pork or a 67% ostrich/33 % pork blend and processed with a commercial spice blend. Results of experiments indicate that value-added ostrich meat products were more acceptable when they were more finely ground, spiced, and combined with pork in a sausage product than when they were prepared as a "ham" product (McKenna *et al.*, 2003). Previously frozen ostrich meat was evaluated over 28 days to determine the refrigerated shelf life and consequence has been drown that, vacuum-packaged ostrich meat stored under refrigerated conditions should be used within 10 days (Otremba *et al.*, 1999). Quality characteristics and storage stability of three types of burgers prepared with ostrich meat (alone or mixed with pork or beef meat) were evaluated. Burgers formulated with ostrich and pork meat had a

faster oxidation rate and became more oxidized than the others (Fernández-López *et al*, 2006). Three different formulations for sausages were prepared, two of them from different ostrich muscles, one – from beef meat. Physical, chemical, and sensory analyses improved that the ostrich meat formula reached the highest general quality scores in the sensory evaluation (Fernández-López *et al.*, 2003). An ultra-high pressure treatment was used to modify the commercial ostrich meat product "Yor" (Thai sausage) as Ostrich meat sausages (yor) were subjected to ultra-high pressures of 300, 500 and 700 MPa for 40 and 60 min at 40 and 60 °C. Subsequently the physical properties of the products, colour, released and expressible water, gel strength and stress relaxation as well as their thermal characteristics (by differential scanning calorimeter, DSC) were determined. The effects of pressure, temperature and holding time significantly influenced the L^*, a^* and b^* values well (Chattong *et al.*, 2007; Supavititpatana *et al.*, 2007). In July 2002 in Turkey an Ostrich meat processing plant was started to build with a capacity to process 65 tonnes per day – the assortment foreseen to produce are steaks, sausages, salami, roasted meat and pressed spicy meat (Ostrich…, 2002). Nowadays consumer demand refrigerated convenient meals, processed using a brief/mild heat treatment. This demand has led to a growth in the application of *Sous vide* and cook-chill processing technologies to extend the shelf life and to keep the quality of raw material. *Sous vide* and cook-chill pasteurized, refrigerated ready-to-eat foods were introduced in about 1970 by Georges Pralus in France as a more convenient food option than frozen food for the food market. Raw food maintains good quality for a few days, while pasteurized foods are acceptable for up to 90 days, or longer if preservatives such acid and salt are used. Translated directly from French, *sous vide* means "under vacuum". In the culinary world the term refers to a French cooking method in which fresh ingredients are cooked in air tight (vacuum-sealed) plastic bags in hot water bath (Sous vide…, 2008). The food maintains maximum flavour because it is slow cooked for an extensive period of time at a relatively low temperature below water boiling point. From an analysis of the conventional process for cooking Korean seasoned beef, a *sous-vide* processing method was developed that offers convenience and storage stability. *Sous-vide* packaging resulted in better sensory quality and storage stability compared with the conventional method (Jang JaeDeok *et al*, 2005). The *sous-vide* packaging was effective in protecting the product from microbial, physical, and sensory quality degradation. In most countries, food industry and retail food establishments are required to comply with the published guidelines/recommendations for microbiologically safe production, distribution, and sale of ready-to-eat, refrigerated foods (Juneja *et al*, 2007). In Europe, recommendations, guidelines, and codes of practice (ACMSF, 1995; ECFF, 1996; Martens, 1997) have been developed to ensure the safe production of *Sous vide* foods with respect to preventing growth and toxin production by nonproteolitic *C. botulinum*. The assurance of microbiological safety is a key factor in the success of cook-chill and *Sous vide* processed food products. The time and temperature combinations recommended by the European Chilled Food Federation (ECFF 1996) were 80 °C for 270.3 minutes, 85 °C for 51.8 minutes, 90 °C for 10.0 minutes, 95 °C for 3.2 minutes, and 100 °C for 1.0 minute. Cook chill, *sous vide* and vacuum packaging are common forms of reduced oxygen packaging (ROP) that occur in retail food establishments. The task of this study was to start with batching of the information on several methods of ostrich ready-to-eat making and secondly – to develop *sous vide* mild cooking method with the aim to adapt it for ostrich meat ready-to-eat preparation with better quality and prolonged shelf life.

Materials and Methods

Bullocks' tenderloin purchased at the local market as cheaper and more similar to ostrich meat was chosen to specify the preliminary experiments. The *sous vide* process is a pasteurization step that reduces bacterial load but is not sufficient to make the food shelf-stable. The process involves the following steps: preparation of the raw materials (this step may include partial cooking of some or all ingredients); packaging of the product in plastic

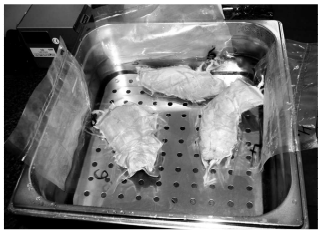

Figure 1. Water bath "Clifton Food Range" with samples

shrink film pouches thickness of 60 μm, 250 gram in each, application of vacuum, and sealing of the package on chamber type machine MULTIVAC A 300/16, vacuum level 99%; pasteurization of the product for a specified and monitored time/temperature water bath "Clifton Food Range" (Figure 1) at ambiance temperatures 90 °C for 45 to 60 minutes, by using full water immersion; rapid and monitored cooling of the product at or below 4 °C and reheating of the packages to a specified temperature before opening and service.

All vacuum packed and pasteurised samples were stored in Commercial Freezer/Cooler ELCOLD at temperature +4±0.5 ºC controlled by MINILog, Gresinger electronic for 20 days. Samples were analyzed before packaging (on 0 day) and after 8 and 20 storage days. pH values of the samples were determinate by METTLER TOLEDO MP120 pH-meter, measurement ranges pH 0.00 to 14.00. Cooking losses were determined by weighing the samples before and after cooking at each experimentally chosen treatment. The tenderness of cooked meat was characterised by compressibility of samples in N before and after cooking as well as at the storage time was determined by the Stable Micro Systems TA.XTplus Texture Analyser, test method compression: pre-test speed 1 mm/s, test speed 1 mm/s, post test speed 10 mm/s, target mode– distance 10 mm, trigger type – auto (force), trigger force 0.2 N. At the storage time microbial Growth dynamics of total aerobic mesophilic bacteria was investigated in the row, marinated and pasteurised meat samples. Microbiological testing was carried out using colony count method in accordance with Latvian standard Ltd. LVS ISO 7218:1996 and LVS ISO 21528-2:2004.

Results and Discussions

The information in the scientific literature as well as in website proved that *sous vide* cooking technology for the time being has not been applied for ostrich meat ready-to-eat preparation.

Microbiological and sensory changes are the main causes of quality decrease of cooked meat and poultry products during cold storage. Heat processes for *sous vide* or cook-chill operations should be designed so that, at a minimum, all vegetative pathogens are destroyed by a pasteurization process. Special labelling of these products is necessary to ensure adequate warning to consumers that these foods must be refrigerated at 5 °C and consumed by the date required by the Code for that particular product (U.S. Department …, 2001). The initial total microbial count of bullocks' tenderloin was $1.3x10^5$, which decreased till $3.1x10^3$ during marinating 12 hours. Changes in the number of micro organisms during storage of *sous vide* processed bullocks' tenderloin are shown in Fig. 2. In our experiments has been found that *sous vide* thermal treatment improved the microbial stability of bullocks' tenderloin with little microbial growth during 20 days storage at +4.0±0.5 °C. The cooking time in the water bath influenced the intransient microbial count as well. The low temperature storage gave the *sous vide* processed product the enhanced storage stability. In future more extensive studies would be needed to obtain a clearer image of bacterial stability and safety for the ostrich meat as a function of added ingredients, storage temperature and heat processing conditions. Initial meat pH value average was 5.643±0.04. The pH of product at the marinating process by the presence of citric acid was decreased slightly to 5.226±0.04, still at the cooking time it again reached the initial level. The pH value at the storage time did not change noticeably due to time of storage.

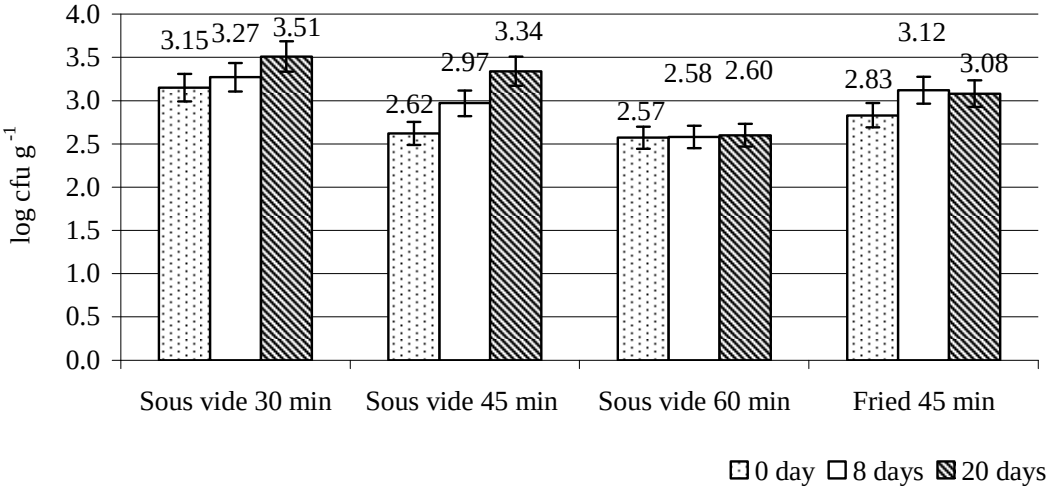

Figure 2. The effect of *Sous vide* cooking time on total aerobic bacterial count of bullocks' tenderloin during 20 days of storage at +4.0±0.5 °C, the temperature in water bath 90 °C

The data obtained in this study revealed the increase in duration of cooking time increases cooking losses from 30.5% if cooking time was 30 minutes to 37% – cooking time 45 to 60 minutes. It has been observed that cooking losses decrease of 15 to 20% during storage time as a result of juice absorption at low temperature. The cooking losses at the frying or rousting process reached about 50% and remained constant at the storage time.

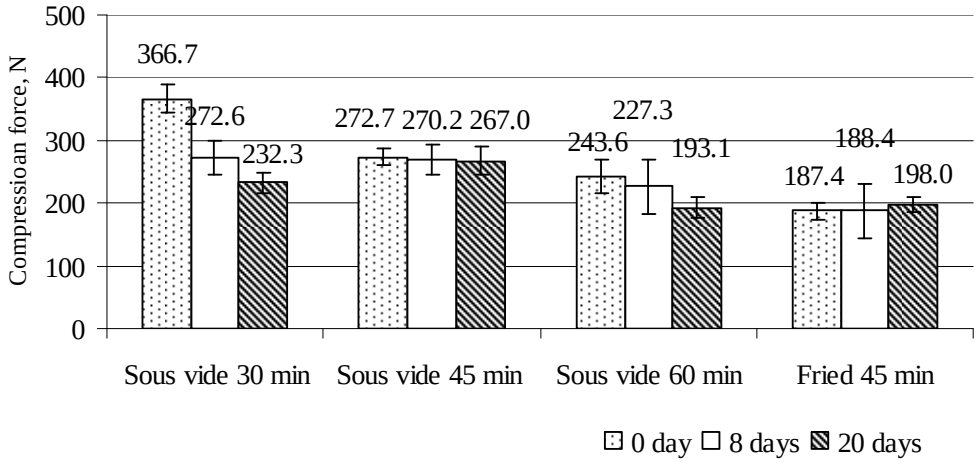

Figure 3. The effect of *Sous vide* cooking time on the compression force of bullocks' tenderloin during 20 days of storage at +4.0±0.5 °C, the temperature in water bath 90 °C

The changes in tenderness characterised by compression force (N) as indicator of readiness of the meat is shown in Figure 3. It is concluded that cooking time at temperature 90 °C at the water bath significantly decreased the compression force from 367.7±23.0 to 243.6±27.0. The least compressing force is found for fried meat, however in this process the cooking losses are highest and meat is not juicy.

Conclusions

Sous vide cooking technology for the time being has not been applied for ostrich meat ready-to-eat preparation.

In future more extensive studies would be needed to obtain a clearer image of bacterial stability and safety to use the *sous vide* technology for the ostrich meat ready-to-eat preparation as a function of added ingredients, storage temperature and heat processing conditions.

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