STABILITY OF DRIED SALTED LAMB STORED UNDER TROPICAL CONDITIONS

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SUMMARY

Meat preservation systems using heavy salting and partial drying have particular advantages for use under tropical conditions where refrigeration facilities are scarce. Such intermediate moisture meats (Aw of approximately 0.75) have an acceptable storage life of up to three months, but are prone to oxidative changes which can cause loss of quality.

In the present study, fresh chilled lamb (24h post-mortem) was minced, mixed with 25% NaCl and 0.4% potassium sorbate, then partitially dried at 40_C for 48h. The partially dried, salted products were stored as follows: (a) overwrapped at 30_C; (b) vacuum packed (VP) at 30_C; (c) VP at 2_C. The raw products were assessed at two-week intervals over a 10 week period for oxidative stability by reflectance spectrophotometry, TBA values, and organoleptic assessment. Pigment oxidation was most rapid in the air-stored samples whilst the VP material showed relatively stable reflectance spectra and TBA values. Sensory evaluation results agreed with the TBA values, with the air-stored samples being less acceptable. Some oxidative deterioration was also seen in the VP products, probably as a result of reactions initiated during salting and drying. Consequently VP does not solve all of the problems relating to oxidation.

Introduction

In Brazil, salted and dried beef ("carne de sol") has been accepted for many years, but in spite of the large potential for goat and sheep production, in the tropical arid regions of this country, products made from these meats are not well established. Consequently, it is desirable that simple technologies appropriate to such regions are developed so that these meats can be better utilized. In many traditional dried salted products, salt is removed prior to consumption by desorbing the meat (or fish) in water. The washed meat is then used in the preparation of a variety of meals. Preliminary work on the storage stability of an alternative product made by partially drying salted minced meat has been carried out by Zapata et al., (1990). Such intermediate moisture meats (Aw 0.75) are microbiologically stable for at least three months under tropical temperature conditions. However, these products are susceptible to oxidative changes which could result in deterioration of the colour, flavour, texture and nutritive value of the product.

The aim of this study was to investigate in more detail how the chemical and organoleptic quality of salted and dried lamb changes under different storage regimes.

Materials and Methods

Two fresh chilled lamb carcasses, 24h post-mortem, were boned, trimmed of fatty portions and ground through an 8 mm plate. The minced meat was formulated to yield products containing 74.6% meat, 25.0% NaCl and 0.4% potassium sorbate. Levels of humectant and antimycotic were assumed sufficient to inhibit bacterial and mould growth during and after partial drying (Ledward 1981, 1985). After mixing, the blend was allowed to equilibrate for 1 h at 2_C. This was subdivided into 250 g portions which were then pressed into burger shapes. These were then partially dried in an oven at 40_C for 48h. The partially dried, salted products were separated into three batches and stored as follows: (a) in air at 30_C; (b) under vacuum at 30_C; and (c) under vacuum at 2_C . The storage stability of the raw products was assessed objectively at two-week intervals using the following analytical procedures :

Colour was measured on freshly exposed meat surfaces by reflectance spectra over the range 370 to 900 nm using a Monolight spectrophotometer fitted with a 0/45_ reflectance head (Millar et al.,1994). Lipid oxidation

was measured as malonaldehyde concentration by the TBA method of Tarladgis et al. (1960) on triplicate samples of each product and expressed as mg malonaldehyde/kg of product.
Quantitative descriptive analysis of the lamb products was performed following a conventional profiling scheme based on five major attributes associated with appearance (darkness, redness, brownness, glossiness, graininess) and four major attributes associated with aroma (fatty odour, rancid odour, raw lamb odour and spoiled meat odour). Attributes were scored on a line scale of 10% (minimum) to 90% (maximum) for each attribute, and the results were collated on a data collection system. All data from sensory evaluation was subjected to analysis of variance (Genstat 5 Committee, 1989). Ten panellists were trained for the appearance attributes using standardised colour discs obtained from the Dulux Trade Colour which is based on the natural colour system (NCS). Futher training was done using minced salted lamb samples of various salt concentrations to cover the range being tested. Panellists were trained for aroma attributes using cooked and re-heated chicken samples and samples of various oils which had been subjected to re-heating for different time intervals to promote different extents of oxidative deterioration.

Results and Discussion

It was found that the initial processing conditions brought about considerable changes in meat quality prior to storage. This was primarily seen as the loss of the characteristic reflectance spectra of fresh red meat (Fig 1). Mean TBA values of 2.0 mg malonaldehyde per kg of product were also found at the end of the drying stage (Table1).

On subsequent storage, colour oxidation proceeded most rapidly in those samples stored in air at 30_C (Fig 2). In these samples, TBA values also reached a maximum of approximately 4.5 mg malonaldehyde per kg of product after six weeks storage (Table 1). In contrast, those samples stored under vacuum at both 2_C and 30_C acquired a darker surface colour yet also retained the red colouration of fresh meat internally, the reflectance spectra remaining comparatively stable over the full storage period. The corresponding TBA values in the vacuum packed samples showed little change over the first six weeks of storage at 2_C beyond which primary oxidation appeared to increase markedly. In contrast, at 30_C, TBA values showed a marked decrease after four weeks storage, possibly due to the involvement of primary oxidation products in secondary reactions.

Sensory evaluation results (Table 2) showed that changes in organoleptic quality coincided with the oxidative changes described above. Storage treatment had a significant effect on each appearance attribute. Those samples stored in air at 30_C quickly became much lighter while those stored under vacuum at 30_C remained fairly constant, whereas those at 2_C became darker. Storage in air at 30_C also resulted in a general decrease in redness and brownness, whereas at 30_C under vacuum these attributes remained fairly constant. At 2_C under vacuum, there was a general increase in redness and brownness. Sensory evaluation of glossiness and salt graininess showed similar trends, with those samples stored in air at 30_C becoming less glossy and more grainy during storage due to surface dehydration. In contrast, both vacuum treatments became less grainy but changed little in glossiness. Several significant interactions between storage treatment and time were found for the various odour attribute (Table 2). In general, odour intensities were greater in both sets of samples stored at 30_C. It is also worth noting that it was only at the end of the storage period that rancid and spoiled meat odours became distinctly more noticeable in those samples stored in air.

Conclusions

Oxidative chemical reactions which affect the colour and lipid stability of dried salted lamb can be limited to some extent by vacuum packaging. However, many of these reactions are initiated during the preliminary salting and drying stages, which undoubtedly contributes to the further deterioration of product quality during subsequent storage under vacuum. Sensory analysis, whilst confirming the changes in appearance by reflectance spectra during storage, failed to establish any relationship between the chemical assessment of lipid oxidation and raw odour characteristics.

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