Hygienic quality and shelf-life of a Moroccan cooked sausage (kasher)

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SUMMARY: The development of the hygienic status of 16 samples kashertype sausage from two meat factories was studied with special regard to the organoleptic and physico-chemical and microbiological aspects.

Moroccan kasher sausages are very prone to changes in microbial status as a result of the high pH-value (6.6) and a_w-value (0.98) and it's exceptional microbial level even after the cooking procedure.

After the storage (3 d) at +25°C the microbial flora increased distinctively. Organoleptic changes were only traceable after the 7th day.

Under cooling conditions these sausages kept their organoleptic characteristics. The microbial flora increased above normal values after one week of storage.

INTRODUCTION: The cooked sausage (kasher type) is a meat product widley distributed all over Morocco as can be witnessed by its presence in almost all general stores where it is s mainly in sandwiches.

According to BELEMLIH (1986), this product without porc and of Jewish origine is actuall and exclusively manufactured for the Moslem consumer and in respect of the definition for cooked sausage leads down in the French code for meat products (ANONYMOUS, 1986).

The studies conducted by BELEMLIH (1986) on commercialized kasher sausage have shown that from the hygienic point of view this product can be considered quite require refrigeration during marketing.

According to these studies the total mesophilic aerobic flora (from 10^5 to 10^8 CfU/g), t total coliformes (10^4 to 10^5 CfU/g), the faecal streptococci (10^5 to 10^6 CfU/g) and even th pathogenic microbial flora, especially the anaerobic sulfite reducing clostridia (from 2 to 120 CFU/g) showed very important variations.

The aim of the present investigation is an attempt to determine whether or not the elevat microbial contents of the kasher sausage is the result of the conditions prevailing during manufacturing and commercializing this product.

The evolution of the product was therefore studied during the process of conservation and under the same conditions under which the marketing takes place, i.e. at ambient temperatur and under refrigeration.

MATERIALS and METHODS: **1. Sampling:** This study was carried out on 16 samples of cooked sausage (kasher type) manufactured by two different meat factories in Casablanca.

The samples were divided in two parts: one part was stored at refrigeration temperatures (+6°C to +10°C), the other was kept at ambient temperature. Samples were periodically taken day 0, 3, 7, 14, 21, 28, and 35.

2. Sensory analysis: Sensory modifications were appreciated according to the usual proce dures.

3. Physico-chemical analysis: These analyses included the measurement of pH (E 250 Metro pH-meter); the water activity (a_w) using Aquadata 253 apparatus; and total volatile bases according to the microdiffusion method of Conway. These criteria were used to appreciate the stability of the product.

4. Microbiological analysis: Total mesophilic aerobic flora was obtained on plate count agar (BK 098) incubated at 30°C for 3 days. Molds and yeasts counts were obtained on potato dextrose agar (Oxoid M 139) incubated for 5 days at 20°C. Coliforms were determined on lactose-desoxylate agar (BK 065) incubated at 37°C for 24 hours. Enterococci were determine

using Rothe broth and Litsky broth as presumptive and confirmative medium, respectively. Sulfite-reducing clostridia were determined using meat-liver agar (BK 097) incubated at 44°C for 48 hours. Staphylococci were determined on Baird-Parker agar (BK 055) incubated at 37 °C for 24 hours. Salmonella was determined by a preenrichment on buffered peptone water (BK 018) followed by an enrichment on selenite sodium broth (Oxoid CM 395) and tetrathionate broth (Oxoid CM 29) and hektoen enteric agar (BK 067). All these media were incubated at 37°C for 24 hours.

RESULTS: 1. **Organoleptic evolution:** The kasher sausage kept at ambient temperature shows a sticky surface with a superficial retraction of the casing. At the 7th day it also shows a dry edge which increases until the 35th day. From the 3rd week, the sausage gets so hard that cutting with a knife becomes rather difficult.

The sausages which are refrigerated hold their taste, smell and their initial consistency during the first two weeks. The dry edge does not appear before the 14th day and develops slowly to reach 3 mm around the 35th day. From the 3rd week, the products get so hard that it becomes difficult to cut sections with a knife.

2. **Evolution of physico-chemical parameters of stability** (fig. 1, 2, and 3): Immediately after the cooking process, the kasher sausages present an average pH-value of 6.6. The slight variations occuring later are of little significance and regardless of the temperature of conservation.

The a_W-value declines during the course of conservation whether at ambient temperature or at refrigeration. However, the decrease is more marked in samples kept at ambient temperature with a_W-values 0.01 units lower than those kept under refrigeration as measured on the 21st day.

No matter what kind of conservations is used, the total volatile bases increases from the beginning up to 35th day but it is more pronounced in samples preserved at ambient temperature where it rises from 12.04 mg-B/100 g (day 0) to 31.00 mg-N/100 g (day 35) whereas under refrigeration it will only reach 24.57 mg-N/100 g on the 35th day.

3. **Microbiological evolution** (fig. 4 and 5): The total mesophilic aerobic flora, the faecal streptococci and the staphylococci show a steady increase all the way during conservation. For sausages preserved at ambient temperature thus the norm for these microorganisms as proposed by BELEMLIH (1986) is already reached on the 3rd day.

The yeasts and molds are also found in rather increased numbers. The yeasts overtake the value of 10^4 CFU/g on the 14th day in the case of refrigerated samples and the 7th day for samples preserved at ambient temperature.

The total and faecal coliforms are found in slight numbers (30 CFU/g) in all samples.

The sulfite-reducing clostridia were not oberserved before the 14th day (5 CFU/g) and 35th day (2 CFU/g) at ambient temperature and in case of refrigeration not before the 7th day (1 CFU/g) and 14th day (3 CFU/g).

No Salmonella were isolated from any of the tested samples.

DISCUSSION: At the end of all operations concerning the production of kasher sausages, the pH-value (6.6) and the a_W-value (0.98) were higher than those fixed by ECC recommendations 76/99 for the conservations of a meat product which could be preserved at ambient temperature.

These values are equally higher than those ovserved for similar product (BARRAUD and BILLON, 1980; BELEMLIH, 1986; STIEBING, 1985). This makes it a product which is easily undergoing alterations: pH >5.2 and a_W >0.95 (RÖDEL, 1975).

This could be confirmed here by the organoleptic evolution, the increase of total volatile bases and the number of microorganisms which rise very rapidly during the process of conservation whether at ambient temperature or at refrigeration.

On the 3rd day of conservation at ambient temperature, the superficial stickness showed

for the first time and the level of microorganisms reached a higher degree than the norms proposed by BELEMLIH (1986) for total mesophilic aerobic flora, the faecal streptococci and the staphylococci. Also the levels of yeasts and molds contributed to the rapid changes of these products.

However, the alterations at refrigeration are progressing slower and the sausages keep their organoleptic characteristics. At the 7th day of conservations, the levels of total mesophilic aerobic flora, faecal streptococci and staphylococci overtake the values proposed by BELEMLIH (1986).

Also AWAD and YOUSSEF (1973) have demonstrated that the organoleptic and chemical modifications of sausages preserved at ambient temperature are more pronounced than those of products kept at plus 4°C.

CONCLUSIONS: From the present study, it can be deducted that the marketing of kasher sausages have to be executed by all means under refrigeration since important alterations occur otherwise from the 3rd day of conservation onwards during the traditional conditions prevailing at the general stores in Morocco.

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Figure 1: pH evolution during storage of Kasher sausages

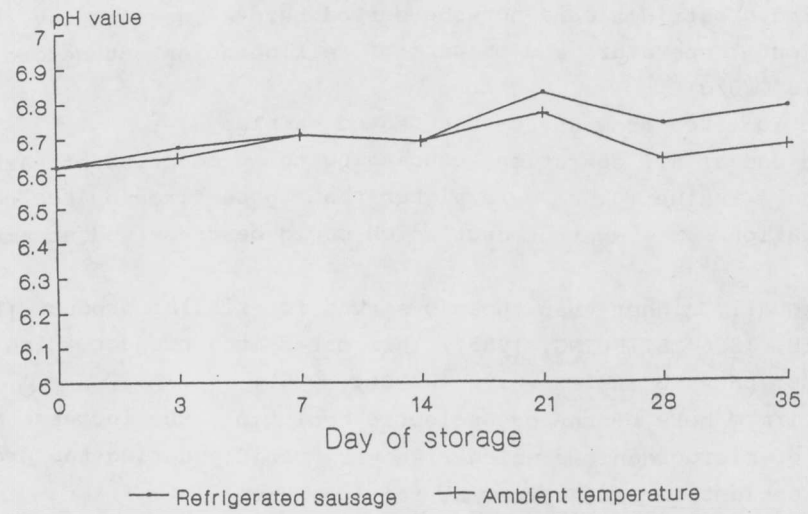

Figure 4: Microbiological evolution of refrigerated Kasher sausages

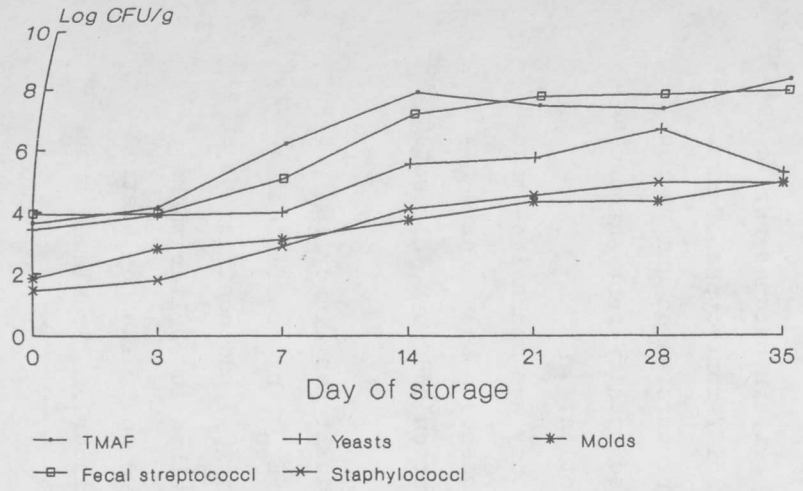

Figure 2: a_w evolution during storage of Kasher sausages

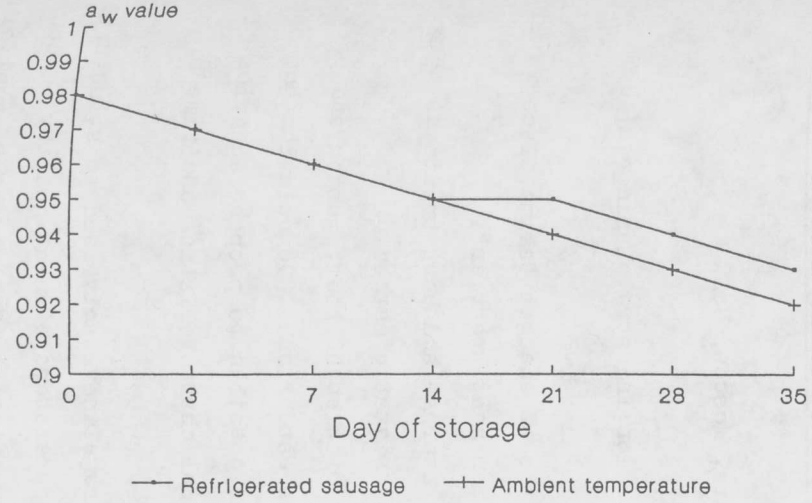

Figure 5: Microbiological evolution of Kasher sausages kept at ambient temperature

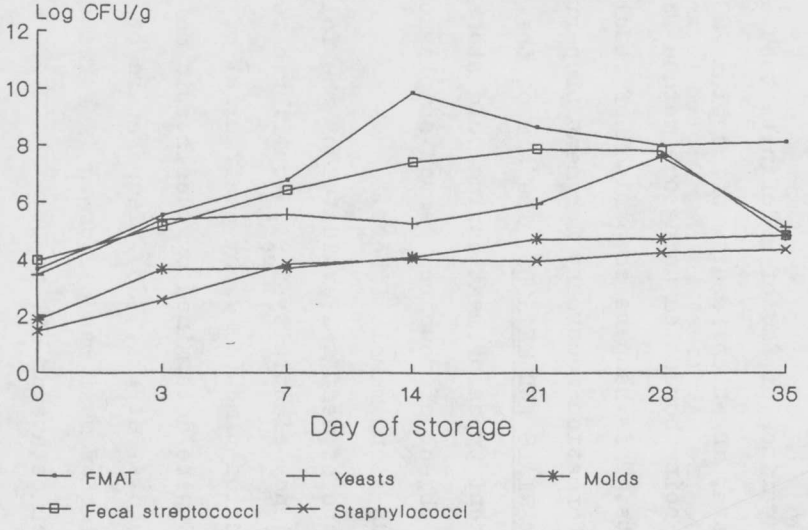

Figure 3: Total volatile bases evolution during storage of Kasher sausages