

Post Harvest Bacterial Changes in Nile Perch at Gikomba Market in Nairobi, Kenya

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ABSTRACT

This study was carried out to analyse the post harvest losses during the retailing of Nile perch (*Lates niloticus*) at Gikomba market. The work was carried out for a period of three months (September to November, 2002). Results of this study showed that the total aerobic mesophilic colony counts ranged between $10-10^2$ cfu/g. Besides, it was found that *Proteus* spp and *Pseudomonas* spp involved in spoilage were present in the sampled fish, fish-contact surfaces and water. The results of this study will be useful to informing policy makers on status of public health in Kenyan fish markets.

1.0. INTRODUCTION

1.1. Spoilage of fish

Fish and other seafoods are considered to be among the most perishable of foodstuffs even when held under chilled conditions (Garthwaite, 1992). The fish muscle is characterized by a high content of non-protein nitrogen (NPN) and a low content of glycogen resulting in a high post-mortem pH (pH>6.0) that favours microbial growth (Frazier and Westhoff, 1988; Love, 1992). In addition, the muscles have a higher content of polyunsaturated fatty acids which are susceptible to oxidative deterioration leading to rancidity, which is most pronounced in fatty fish (Morrison, 1993).

Most retail markets in Kenya do lack cold stores or refrigerated rooms. Fish is displayed either singly or in small numbers on top of tables or in trays exposed to the air and ambient temperatures. Therefore a lot of fish go to waste because of spoilage arising from bacterial spoilage. Examples, *Proteus* spp are known to be the most potent histamine producers found on most fish as a result of post-harvest contamination (Taylor and Stratten, 1991). Further, Okumu and Sifuna (2000) have reported quality losses of 6.4% in Nile perch at Nyakach Bay along Lake Victoria. It was also noted that fish-contact surfaces and hands of personnel handling fish in the very establishments were identified as potential sources of fish contamination with these organisms.

1.2. Justification

There are limited studies on local retail markets far away from landing beaches despite the fact that some quality changes are expected to take place as fish is transported to these markets. It is against this background that this study was designed to conduct a survey on the post harvest losses of retail 'wet' or fresh fish at Gikomba retail market in Nairobi.

1.3. Objectives

The objective was to:

- (i) Determine changes in fish spoilage microbiological population in Nile perch fish during retailing at Gikomba market with time.

2.0. MATERIALS AND METHODS

2.1. Collection of fish

Six kilograms of fresh Nile perch fillets were bought from the markets on every sampling occasion for the period from September to November 2002 and taken to National Public Health Laboratory in a cooler box filled with ice. The retailers from whom the fish were bought were randomly selected on each sampling date.

2.2. Stock Solution

Fish samples (10g) were excised aseptically and transferred to 90 ml of 0.1% buffered peptone water (Difco) in sterile flasks and homogenised to make a 1:10 M/V dilution. The homogenate was thoroughly mixed before making serial dilution(s) according to International Commission of Microbiological Specifications for Food (ICMSF) (ICMSF 1978). The resulting homogenate was used for all the microbiological tests (Stock solution). The media used in this study are as edited by Rohde, P.A. 1973.

2.3. Microbial analysis of water

Microbial analysis of water was done according to procedures recommended by the World Health Organization

(W.H.O) (1984).

2.4. Data Management and Analysis

The data was managed and analysed using the SPSS package. The package assisted in obtaining the means. Where significance was indicated, Tukey's test was used to determine the source of the observed differences.

3.0. RESULTS AND DISCUSSION

3.1. Aerobic mesophilic colony count (AMCC)

The results of aerobic mesophilic colony counts (AMCC) of Nile perch at Gikomba market are shown in Table 1. Within these three means of AMCC there was no significant difference:

Fish species	Time	AMCC (cfu/g)
Nile perch	0h	1.6 x10
	12h	1.9 x10 ²
	24h	1.6 x10 ²

Table I: Average of triplicate count

Determination of AMCC in fish is very important to assess the extent of spoilage as well as contamination. High AMCC are normally due to either surface contamination or because of phenomenal growth bacteria during spoilage, which in any case is undesirable as they can cause further spoilage of fish rendering it unfit for human consumption. In addition, the observed hygiene at the markets is wanting. For example, tap water at the market does not run throughout forcing the fish retailers to continuously the little water they have to wash a lot of fish. The open drainage system where flies leave and land upon the displayed fish. The International Commission of Microbiological Specifications of Foods (ICMSF) recommended that raw fish having AMCC of less than 10⁶ cfu/g should be considered good quality while those having AMCC in excess of 10⁷ cfu/g be considered unacceptable (ICMSF,1986). On the basis of this guideline, it appears that the fresh fish received at the markets was of acceptable quality. This was probably due to low temperatures necessitated by the layer of crushed ice on top of the fish while on transit. Sumner *et al.*, (1982) stated that maintaining a temperature below 10°C is considered adequate if the processing time is not prolonged. This will control growth of pathogenic and spoilage organisms.

3.2. Pseudomonas spp count and presence of Proteus spp

There were no significant differences in the mean number of *Pseudomonas* spp obtained at 0 h, 12 h, and 24 h intervals (t-test, P>0.001). Besides, *Proteus* spp were present in all samples of Nile perch but isolates were not characterized further.

Fish species	Time	<i>Pseudomonas</i> spp (cfu/g)	Presence of <i>Proteus</i> spp
Nile perch	0h	3.8 x10	+ve
	12h	1.6 x10	+ve
	24h	0.00	+ve

Table 2: Average of triplicate count

The presence of hydrogen sulphide producing bacteria signifies spoilage (Chai *et al.*, 1968). *Proteus* spp identified by the production of hydrogen sulphide often changes the colour of cooked fish especially in canned fishes and is undesirable. The colour of the product will often turn black and aesthetically unacceptable to the consumer. In the present study, the samples tested had hydrogen sulphide producing bacteria, *Proteus* spp at high levels. Their high levels on fish are mostly as a result of post-harvest contamination (Huss, 1994b). Therefore, fish inspectors should monitor the retailers of these fish to ensure that hygiene is highly observed. Besides, *Proteus* is unique among the enterobacteriaceae because it produces urease, which splits ammonia from urea. It is associated with histamine production in a variety of meat products and also in fish (Banwart, 1987). *Proteus* acts on histidine and converts it to histamine, which triggers allergic reactions in the consumers and may result in death (Sjaifullah, 1978). The facts that the presence was observed in the samples tested should therefore indicate a health hazard.

3.3. Bacteriological examination of fish –contact surfaces

The results of laboratory analysis of swabs from fish-contact surfaces at Gikomba market are shown in Table 3.

Description of contact surface	AMCC (cfu/100cm ² /1ml)	<i>Pseudomonas</i> spp (cfu/100cm ² /1ml)	Presence of <i>Proteus</i> spp
Tables	1.1 x10 ²	0.00	+ ve
Baskets	4.3 x10 ²	2.3 x10 ¹	+ ve
Vehicles	5.5 x10 ²	0.00	+ ve
Clothing	1.3 x10 ²	0.00	+ ve
Water	7.2 x10 ²	5.5 x10	+ ve
Personnel hands	8.2 x10 ¹	0.00	+ ve

Table 3: Average of triplicate count

Personal hygiene and sanitation are important in the fish industry in prevention of contamination of product with micro organisms (Huss, 1994 b). In the present study, it has been observed that fish-contact surface, water and personnel hands were likely sources of contamination in fish. In poultry processing plants, working surfaces have been found to be contaminated with various types of coliforms (Schuler and Badenhop, 1972). Wherever, practicable the surface should be continuously flushed with running water-containing 4ppm of residual chlorine as recommended by Cheng *et al.*, (1985). Personnel hands should also be washed with soap and or other cleansing agent before commencing work.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1. Conclusion

In conclusion this study has revealed that handling and general marketing practices were highly inadequate in maintaining the fresh quality of fish. The practices identified were displaying of fish over open drains, repeated chilling and exposure to ambient temperatures of the same batch of fish especially at market and display of fresh fish in dirty containers with drips from previous sales.

4.2. Recommendations

From the study, the following recommendations are proposed;

- Running tap water, toilets, fly-proof sheds and good sanitation should be provided at the market centres
- Retailers should be discouraged from intermittent chilling and exposure to ambient temperatures of same batch of fish as this increases chances of contamination.
- Plastic trays and tables used for display of fish should be washed frequently with running tap water containing 4ppm residual chlorine.

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