Prevalence of bacteria in the muscle of shrimp in processing plant

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Abstract

Standard Plate Count method was used to determine the Bacterial loading in shrimp muscle in the shrimp processing plant. The experiment was carried out at receiving center, after first washing with 5 ppm chlorinated water and frozen shrimp. Assessment of bacteria and comparison was made among the five suppliers from whom the plant used to purchase the shrimp. The bacteria levels in the muscle decreased over time in shrimp in all five suppliers and varied between $8x10^5$ CFU/gm and $6x10^5$ CFU/gm. The concentration of bacteria level was found below permissible level and presents no harm to human health.

Introduction

Proper handling of fish between capture and delivery to the consumer is a crucial element in assuring quality of the final product. Standards of sanitation, method of handling and the time/temperature of holding fish are all significant factors to assure quality. With a few exceptions, fish are considered free of pathogenic bacteria of public health significance when first caught. The presence of bacteria harmful to man generally indicates poor sanitation in handling and processing and the contamination is almost always of human or animal origin.

A number of microbiological tests of fish and fish products are used by authorities to check that the microbiological status is satisfactory. The purpose of these tests is to detect pathogenic bacteria (*Salmonella, Staphylococcus aureus, E. coli*) or indicator organisms of fecal pollution (*fecal coliforms, fecal streptococci*) or other types of general contamination or poor handling practices (coliform bacteria, *faecal streptococci, total viable count)*. Microbiological testing can be costly and time-consuming. Estimation of bacterial numbers in fish is frequently used to retrospectively assess microbiological quality or to assess the presumptive safety of the product. By testing for and counting the bacteria on machinery, equipment, and personnel in the production area, the standard hygiene level and the efficiency of cleaning of procedure can be monitored. This ensures that the products will not become contaminated in the manufacturing plant.

Standard Plate Count (SPC) is used to determine the total number of aerobic bacteria present at mesophylic temperatures (30^0C-37^0C). The SPC can be used as general, relative gauge, of the overall load of a product. When SPC is used as a part of a shelf life analysis to determine spoilage, the number generated can be compared from test interval to test to verify if the bacteria initially present are capable of growing. When SPC reaches 1,000,000 CFU (Colony Forming Units) per gram or milliliter of product (ICMSF 1986), the product is assumed to be at, or nearing, spoilage. The number may vary greatly and the ultimate shelf life determination should be based upon the physical changes the product is undergoing. The study was carried out to assess the bacterial level in shrimp muscle through out the processing. The result would help creating awareness among the processors and consumers of the potential sources of contamination.

Materials and Method

Shrimp from five suppliers were collected during April to June 2003 in Sobi Fish Processing Industries Ltd. Khulna. Each supplier is given a code number for maintaining individual record. Shrimp weighing 200 gm

were taken from the following steps for microbial analysis.

- Receiving center before washing
- After first washing
- Frozen shrimp

Dilution and plating were carried out soon after sampling and each sample unit was numbered orderly. Each dilution was plated by pepeting 1 ml of dilution into a sterile petriplates. Approximate 15 ml of plate count Agar, which has been melted and brought to 45^0 C was poured into the plates. The plates were rotated by hand at least 5 times in the clockwise direction and 5 times in anti clockwise direction. Finally several times crosswise rotation was made for equal distribution of the media. After solidifying the plates were inverted and placed in incubator at 37^0C for 48 hours.

Results and Discussion

Levels of bacteria in shrimp decreased gradually over time in all the successive stages. In all cases, the SPC levels from 5 suppliers decreased. The SPC level was found above 12 x 10^5 CFU/gm carried out by five suppliers during April 2003 in the landing center (Fig.1). Likely the SPC further reduced between 12 x 10^5 and 8 x 10^5 CFU/gm while dipped into chlorinated water. After freezing, the SPC levels further reduced to below 6 x 10^5 CFU/gm. Areerat *et al.* (1999), observed the presence of vibrio sp. in shrimp muscle between 1.08 x 10^4 and 7.36 x 10^3 CFU/gm, while it reduced between 1.30 x 10^3 and 5.60 x 10^2 after dipping in chlorine water.

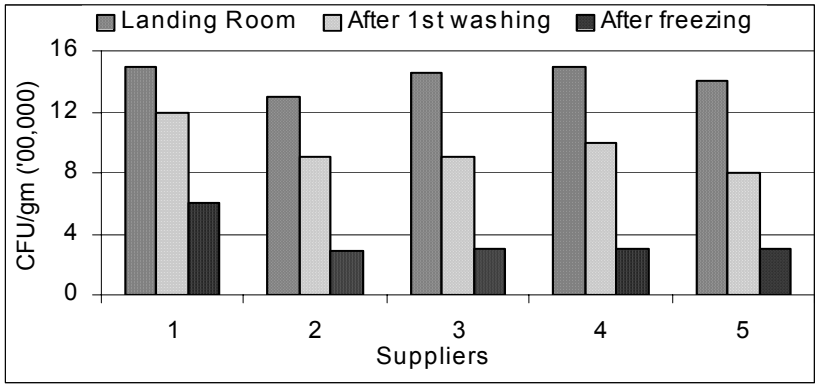

Figure 1: Number of SPC (CFU/gm) in shrimp during April 2003

The same downward trend was observed amongst rest of the samples taken during May and June 2003 (Fig. 2 and 3). It is evident that the microbial load decreases after washing in chlorinated water and freezing. Consumption of raw shrimp should be avoided, as bacterial levels indicated in the table are relatively high. This is particularly important if the shrimp are not properly chilled as some bacteria may survive and cause health problems.

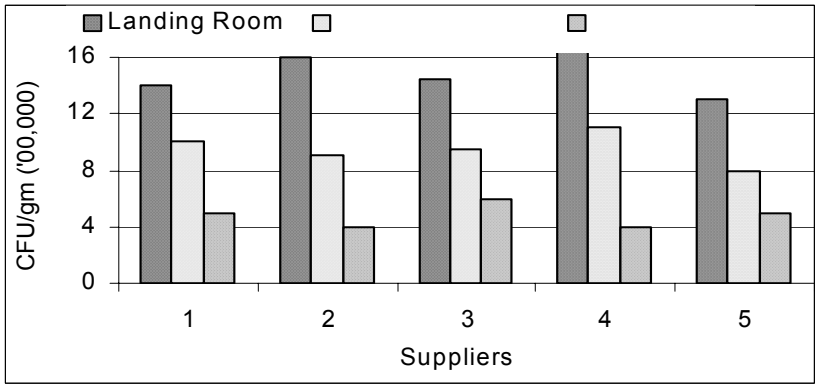

Figure 2: Number of SPC (CFU/gm) in shrimp during May 2003

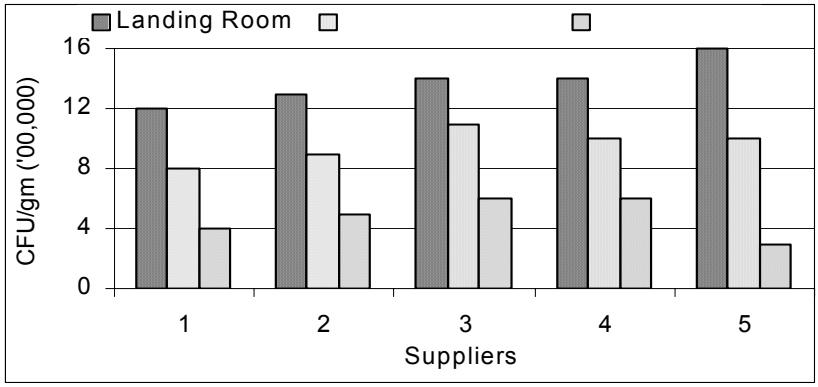

Figure 3: Number of SPC (CFU/gm) in shrimp during June 2003

Conclusion

Bacteria found in shrimp muscle were higher in landing shrimp than frozen shrimp. Levels of bacteria gradually decreased over time, due to low temperature during storage than due to washing in chlorinate water. However, chlorinated water plays an important role in reducing surface contamination.

References

Areerat, S., C. Limsuwan, P. Chanratchakool and T. Somsiri. 1999. *Bacterial levels in the muscle of post-harvested shrimp*. Asian Fisheries Science. 12: 357-360.

ICMSF (International Commission on Microbiological Specifications for Foods), 1986. *Microorganisms in foods 2 - Sampling for microbiological analysis: principles and specific applications.* Toronto, Ontario, Canada, University of Toronto Press (second edition).