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Study on microbial properties of Frankfurters during shelf life

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ABSTRACT

The frankfurters are one of most famous and most adherent Sausage. They are produced from pork or beef meat or a product of any kinds of meats. Shelf life of meat products which treated by heat, depends on some factors. The most important factors are quality of raw materials. Shelf life of meat products depend also on composition and increasing of microfilor in production time and this increasing depends on maintenance heat, pH, water activity, concentration and amount of salt and nitrite added and also other additives. In this study on Frankfurters produced indoor without vacuum-packaging was done. Total of 10 samples which produced in same time and randomly from different batches were collected. These samples were studied from production time to 5th week. The tests Bacterial total count, mold and yeast total counts, coliform count, psychrophilic microorganism count and coagulase positive staphylococcus aureus were performed on basis of No. 2303,1194,437,997,356 protocol of Iranian standard institute. The results were analyzed by paired T-test and mean of microbial counts were compared in different weeks. The results showed a significant increasing ($p < 0.05$) in microbial counts in different weeks. All of the samples failed in 1st & 2nd week in optimum microbial counts. This indicates that the products had low quality for marketing. No coliforms can be detected in 5 week.

Key words: microbial properties, Frankfurters, shelf life.

INTRODUCTION

Meat products are products that insist of at least one half of it meat. These products are one of most consuming food products. Dry Sausage produced as a result of finding of new spices. These spices can help to improve flavor and increasing of shelf life of meat. Many kinds of Sausage are produced depending on raw material in area and different climates. Microbial growth during storage is one of the main factors affecting the quality of meat products, leading to spoilage and hence economic losses. Emulsion-type sausages like wiener, bologna-type sausage and frankfurter may spoil more quickly due to high pH and aw. Many vegetative cells can be inactivated with cooking process [23, 27]. Sausage may be contaminated after heat processing and

during other processes such as slicing, packaging, peeling [3, 21]. Many studies have determined the presence of food-borne pathogens in these products, such as *Listeria monocytogenes*, *Staphylococcus aureus*, *Clostridium perfringens*, and *Salmonella* spp. [6, 28]. As for *L. monocytogenes*, several studies showed that emulsion-type sausage is risky, because the bacteria have high tolerance to physical conditions compared to other pathogens. Moreover, this food-borne pathogen is able to grow at refrigeration temperatures [19, 25, and 28]. The aim of this study is to determine the microbial properties of Frankfurters during shelf life.

MATERIALS AND METHODS

This study was carried out by using a total of 10 samples frankfurters with similar produce time from different batch were collected and then, these samples by ice-Box to laboratory of food hygiene in Islamic Azad University Tabriz brunch were transported. These samples after transportation to laboratory at 4°C were protected and then study on microbial properties during shelf life from first week until 5 week was done. Providing and culture for samples according to Iranian standard institute No: 2303, 1194,437,997,356 was done. Data were analyzed by using of spss (version12) software and Paired T- test. For microbial counts, 10 grams of frankfurter representative sample were removed aseptically from each and homogenized samples in 90 ml of 1.5%peptone water, using a stomacher. From plate Count Agar (Merck) incubated at 37 °C for 48h, and the pour-plate method for enumeration of Aerobic plate counts (APC) were used. Violet Nutral Red Bile Lactose Agar (Merck), which was incubated at 37°C for 24 h, used for coliform counts. Cooked meat salt medium (Merck) and Bird Parker agar (Merck) used for coagulase positive staphylococcus aureus counts and incubated at 37°C for 48h. For mold and yeast total counts of Sabro Dextrose Agar (Merck) plates incubated at 25°C for 5 days were used. Psychrophilic microorganism counts used of Nutrient Agar (Merck) and plates incubated at 5-20°C for 24h [8, 9, 10, 11, 12, and 13].

RESULTS

The results of this study in 4 parts provided:

1 – According to Iranian standard institute maximum permissible range for total bacterial count is 10cfu/gr, but the microbiological analysis results of this study showed that, this amount at second week was more than this range. By attention to results of this part during 5 weeks, a significant different ($p<0.05$) between different weeks were observed. Figure 1 showed the variation of average total bacterial count of frankfurter during 5 weeks at 4°C.

2 – Normal range for coagulase positive staphylococcus aureus count according to Iranian standard institute is 0cfu/gr. In this study, this amount in week of 3 got through the permissible range. A significant different ($p<0.05$) in comparison between weeks of 2 and 3 were observed, but between other weeks were observed. Figure 2 showed variation of average total coagulase positive staphylococcus aureus count of frankfurter during 5 weeks at 4°C.

3 – For psychrophilic microorganism count this range is 10^2 cfu/gr, but for this study in first week of shelf life was non permissible and A significant different ($p<0.05$) between weeks of 3 and 4 of shelf life were not observed but between other weeks were observed. . Figure 3 showed variation of average total psychrophilic microorganism count of frankfurter during 5 weeks at 4°C.

4 – The normal range of mold and yeast in Iranian standard institute is 10^2 cfu/gr and this samples in first week showed abnormal range. For this group of microorganism only between

weeks of 3 and 4 a significant different were not observed. Figure 4 showed variation of average total mold and yeast counts of frankfurter during 5 weeks at 4°C.

Of course in present study during 5 weeks, coliforms from samples were not isolated, that is confirm with Iranian standard institute.

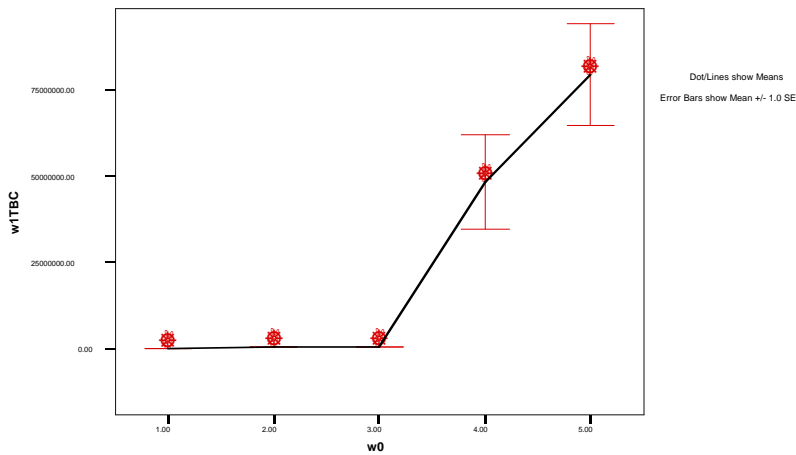


Figure 1: variation of average total bacterial count of frankfurter during 5 weeks at 4°C

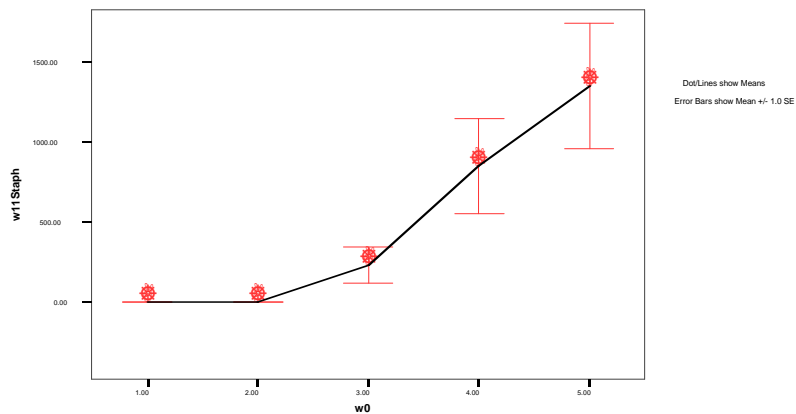


Figure 2: variation of average total coagulase positive staphylococcus aureus count of frankfurter during 5 weeks at 4°C

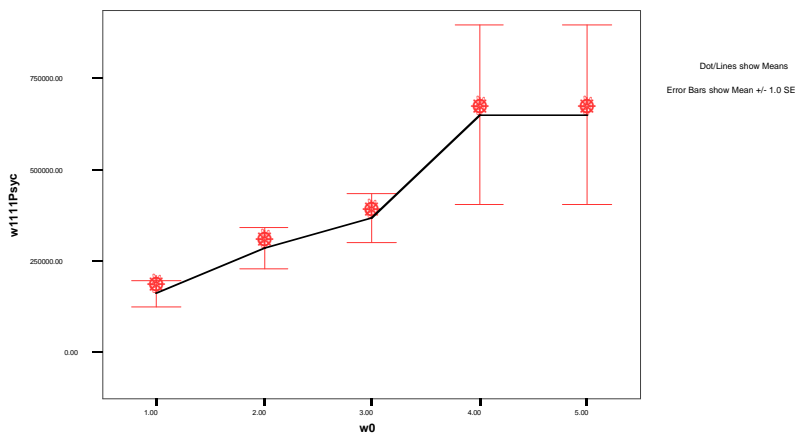


Figure 3: variation of average total psychrophilic microorganism count of frankfurter during 5 weeks at 4°C

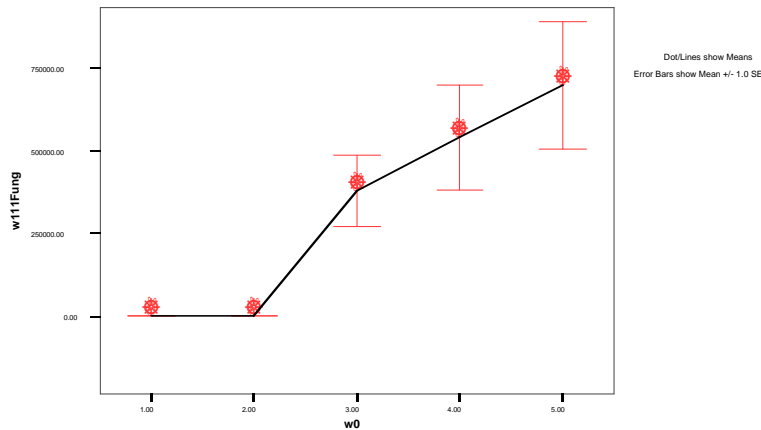


Figure 4: variation of average total mold and yeast counts of frankfurter during 5 weeks at 4°C

CONCLUSION

Microbial contamination may be added or reduced at different stages of processing of Frankfurter and Friedhoff *et al.* (2005) have described the use of simple microbiological criteria, including aerobic mesophilic colony counts, Enterobacteriaceae counts, and in some instances, enumeration of yeast, performed on samples taken during processing in small businesses to verify good manufacturing practices [5]. This verification through monitoring was found to be an attractive alternative to the examination of end products and also coliform bacteria are one of most importance indicator organisms that are most commonly used to ensure food safety include coliform bacteria, fecal coliform bacteria, *E. coli*, total Enterococcus spp., and aerobic plate count (APC) [16,20,22]. In present study coliform bacteria were not isolated because the Frankfurter is one of cooked sausage type and this subject is not confirming with one study by Dowdell and Board [4] on microbiological survey of British Fresh Sausage, coliform bacteria were founded. also in one study by Sachindra *et al.* coliforms from raw and cooked sausage were founded and in cooked form of sausage less than raw sausage were distinguished therefore by attention this These results demonstrate that cooking process cases reducing the microbial counts substantially in the sausage or absence of this agents after this process. Coliform group bacteria counts in two studies by Apaidin *et al* were reported [1, 24].

In study of Sachindra *et al.* coliforms from raw and cooked sausage were founded but staphylococcus aureus not reported which is not confirm with present because our study after second week in Frankfurter samples staphylococcus aureus between 4.5×10^2 cfu/gr in 3 week to 5.6×10^2 cfu/gr in week of 5 were founded. In study by Apaidin *et al* on Chemical Quality of Vacuum-Packaged Frankfurters staphylococcus aureus from samples of this study were isolated, this results shows the importance of staphylococcus aureus in food industry because this agent cases dangerous disease in human and have very importance in human health [1, 24].

Vacuum packaging is generally used for cooked products, and these products have scarcely high yeast and mold counts [14, 15]. High yeast and mold counts may have originated from insufficient vacuum and/or refracted vacuum. In this study yeast and mold count from 5.6×10^2 cfu/gr in first week to 1×10^6 cfu/gr in fifth week were founded which is confirm with one study by Apaidin *et al*, but this amount in comparison with one study by Sachindra *et al.* is high, for this reason and according to Iranian standard institute in first week showed abnormal range and nonstandard were distinguished [1].

Psychrophilic counts in first week of shelf life was non permissible and A significant different ($p < 0.05$) between all weeks of shelf life were not observed but in study Sachindra *et al.* this microorganisms shows a low growth during time of this study [24].

In a study on vacuum packed cooked ring sausage during storage, a shelf life of 20–28 days [18] and 43 days [17] has been found. A shelf life of 49 days in frankfurter sausage packed in CO₂ was recorded [2].

In addition must say which some study shows that by augment the additives ,onion, garlic meal, pepper and E vitamin can decrease the microbial agents in cooked sausage products[7,26,29].In conclusion, the study revealed the pattern of microbial profile associated with the preparation of Frankfurter. Lower initial microbial levels of sausage mix, effective heat treatment during cooking, careful handling of cooked sausage, and maintenance of adequate chill temperature during storage would improve the microbiological quality and enhance the shelf life of Frankfurter. Application of vacuum or CO₂ would further reduce or inhibit the microbial growth and enhance the shelf life of Frankfurter.

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