

Microbiological studies on frozen foods and canned foods

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The studies aimed for the microbiological evaluation of some foods available in the local market to determine their acceptability for human consumption. The study included the following:

- I- Survey samples :1. Canned foods (low acid canned foods) :2. Frozen foods: A- Vegetables (green beans - okra) B- Frozen meat, frozen minced meat.
- II- Storage samples :To study the effect of storage temperature and period of storage:1- low acid Canned food.2- Frozen vegetables and frozen meat.
- III- Longevity samples :To study the longevity of Staph. aureus, E. coli and Salmonella sp. in frozen minced meat and frozen vegetables.

Survey samples : I. Canned foods : The cans were opened and examined for colour, appearance, ... etc. and the study of the contents of the cans revealed the following.-- pH decreased in some samples, but pH was normal in the majority of samples. and the microbiological examination of the contents of the cans showed the following:- Samples of the canned fish were free from the mesophilic anaerobes and thermophilic anaerobes also the examined cans were free from yeasts and moulds and free from H₂S producing bacteria except one sample contained H₂S producing bacteria.- The aerobic bacteria was present in low numbers and the mesophilic aerobes were higher than thermophilic aerobes.

2. Frozen vegetables (green beans and okra) : a- Frozen green beans:- Total count: Samples taken in 1994 were within the valid limits (100 000 cell/g of sample) in the majority of samples. However, some samples exceeded the valid limits of total count.- In 1995 and 1996 the examination of the samples showed the same trend i.e the majority of the samples were within the valid limit, but some samples were out of limit. The results of T.C. showed that counts varied from company to another company and also differed from year to year for the same company.- Concerning yeasts and moulds counts in frozen green beans it was found that some samples of 1994 and 1995 contained higher yeasts and moulds counts than the valid limits (less than 50 cell/g), but the remaining samples were within the valid limits. But samples examined during 1996 were within the valid limits of yeasts and moulds.- Samples of frozen green beans were free from Salmonella sp. and Clostridium perfringens during 1994, 1995 and 1996.- Staph. aureus was present in frozen green beans samples during 1994. However, Staph. counts were reduced greatly in samples taken during 1995 and 1996.- E. coli was present in some samples of 1994 and was less frequent in samples of 1995 and disappeared completely in samples of 1996. Concerning frozen okra which was examined during 1994, 1995 and 1996, T.C. for the examined samples during 1994 was within the valid limits (100 000 cell/g) except some samples which exceeded the valid limits. T.C. of samples of okra during 1995 and 1996 were within the valid limits.- Yeasts and moulds in frozen okra increased in the samples examined during 1994 and 1995, but their numbers decreased greatly during 1996.- Samples of frozen okra examined during 1994, 1995 and 1996 were free from the pathogens Salmonella and Clostridium perfringens.- E. coli which is an indicator of pollution was detected in two samples during 1994 and one okra frozen sample during 1995 and disappeared completely in all investigated okra frozen samples during 1996.

b - frozen minced meat

Survey samples - T.e. of the investigated minced meat samples was within the valid limits (less than 10⁶/g) for all examined samples during 1994, 1995 and 1996.- Yeasts and moulds counts were higher than the valid limits (50 cell/g) for samples of 1994, 1995 and 1996.- All frozen minced meat samples examined during 1994, 1995 and 1996 were free from Salmonella and Clostridium perfringens.

II- Storage samples :- Canned sardine: Canned sardine stored at 37°C yielded the

following:

- No gas production in the stored cans during the storage period (6 months) indicating the absence of gas producing bacteria and no reactions between the food material and the metal of the cans.
- No pronounced change in the pH of the examined sardine cans indicating the absence of acid-producing organisms.
- T.e. of stored sardine cans were low at the beginning due to the drastic effect of the heat treatment. However, there was a trend of increasing T.C. by increasing the storage period.
- Yeasts and moulds disappeared completely from the examined sardine cans.
- All investigated samples were free from I-hS producing bacteria except one sample showed H₂S production after 4 months storage.

- Canned sardine at 55°C showed the following :-

- Aerobes counts were higher than the counts of anaerobes.
- Thermophiles counts were higher than mesophiles.
- There was a slight change in pH in the majority of investigated samples. Only one sample - in which pH decreased greatly.
- There was coincidence between microbial counts and pH. As total count increased pH decreased.
- Yeasts and moulds didn't appear in samples stored at 55°C.
- Gas formation appeared at the late periods of storage (4-6 months) in cans stored at 55°C.
- H₂S appeared only in one can after 4 months storage.

The storage of frozen vegetables showed the following results :-

- Total microbial counts of frozen vegetables, which were stored frozen for 18 months, were within the valid limits (100 000 cell/g).
- Generally, there was a trend, which showed that as storage period increased r.c. decreased.
- Psychrophiles counts in frozen vegetables were moderate and there was a general trend, as storage period increased Psychrophilic organisms increased.
- Yeasts and moulds in frozen vegetables were within the valid limits (less than 50 cell/g) and decreased as storage period increased to disappear completely after 12 - 15 months storage.
- Coliforms counts decreased greatly as storage period increased.
- E. coli didn't appear in some frozen vegetables samples and appeared in some samples where it decreased by increasing storage period to disappear completely after 15 - 18 months.
- Concerning pathogens, Salmonella and Clostridium perfringens were absent in frozen vegetables, but Staph. aureus was found and their counts decreased by increasing the freezing period to disappear completely after 15 - 18 months.

Concerning the storage of frozen meat, results showed the following:-

- T.e. decreased as freezing period increased.
- Psychrophilic bacteria increased as freezing period increased.
- Yeasts and moulds counts decreased as freezing period increased.
- Coliform bacteria, in frozen meat, decreased as freezing period increased.

III- Longevity of inoculated pathogens in frozen vegetables and minced meat:

Longevity of inoculated pathogens in frozen vegetables and frozen minced meat, stored for 3 months under freezing conditions showed the following results:

- The freezing process decreased Salmonella counts in frozen minced meat to 50%.
- Storage for 3 months freezing conditions decreased the counts of Salmonella to disappear completely after 3 months in frozen vegetables and to decrease greatly in frozen minced meat after 3 months storage.
- It seems that the components of minced meat protected Salmonella to some extent from the drastic effect of freezing.

Concerning the longevity of inoculated Staph. aureus to frozen vegetables and frozen minced meat during freezing and during storage at freezing conditions, results show the following:-

- The freezing process caused reduction in Staph. aureus counts in vegetables and minced meat.
- The storage of frozen vegetables and frozen minced meat under freezing caused continuous reduction in Staph. aureus counts along the storage period (3 months).
- Concerning the longevity of inoculated E. coli in frozen vegetables and frozen minced meat, it behaved as Staph. aureus, since freezing caused reduction in E. coli counts and storage at freezing conditions caused continuous reduction of E. coli counts.