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Summary

Two hundred random samples of kareish cheese including, products of large scale dairy plants (50 samples), small scale producers (50 samples) and farmers houses kareish cheese (100 samples) were collected.

In dairy plants cheese is manufactured, processed and packaged in improved plants which help in production of high quality stable dairy product. The growth of pathogenic bacteria in dairy products is influenced by thermal treatment during processing and by conditions within the product such as pH, water activity, presence of inhibitory substances or competitive microorganisms, **(Ray,1996).**

While, the traditional method for kareish cheese production affords many opportunities for microbial contamination. It is generally made from raw skim buffaloes or cows milk which is often of poor bacteriological quality owing to the high microbial load present in raw milk and the unsatisfactory conditions under which is produced. Also this product is sold uncovered and without container which act as a good medium for the growth of different types of spoilage and pathogenic microorganisms, **(Yousef,2004 and Dawood et al.,2006).**

Our current results indicated that kareish cheese samples collected from large scale dairy plants, had aerobic plate count ranged from $5x10^2$ to $8.8x10^3$ with a mean value of $2.9x10^3 \pm 2.6x10^2$ bacteria /g. Most of examined samples (94%) had counts ranged from 10^3 to $<10^4$ /g. 74% of the examined samples contained psychrotrophs in numbers varied from <100 to $3.8x10^3$ with a mean value $4.3x10^2 \pm 9.2$ x10 /g .The majority of the positive samples (81.1%) had counts ranged from 10^2 to $<10^3$ /g.

74% of samples were contaminated with enterobacteriaceae in numbers varied from <10 to $4.4x10^3$ with a mean value of $1x10^3$ $\pm1.7x10^2$ /g. The highest frequency distribution (81.1%) lies within the range of 10^2 to $<10^3$/g.

29 (58%) of samples were contaminated with coliforms .The majority (58.6%) were present between 10 to $<10^2$ /g. 42% of the examined samples were contaminated with fecal coliforms .The highest frequency distribution (57.1%) was less than 10 /g. E.coli was existed in (4%) 2 samples only out of 50 samples examined . All positive samples (100%) were present in between 10^2 to $<10^3$ /g.

34% of samples were contaminated with enterococci in numbers varied from <100 to $1.1x10^3$ with a mean value of $4.3x10^2$ ±9.2 x10 /g. 94.1% of samples lies within the range of 10^2 to $<10^3$/g. Staph.aureus was existed in 6% only of samples in numbers ranged from <100 to $4x10^2$ with a mean value of 2.6 $x10^2$ ±1.4 x10/g. All positive samples lie within the range of 10^2 to $<10^3$/g.

58% of samples were contaminated with anaerobes. Yeasts were existed in 9 (18%) of kareish cheese samples collected from large dairy plants in numbers ranged from <10 to $1.5x10^3$ with a mean value of $2.1x10^2$ ±5.3x10/g. 55.6% of the positive samples were contaminated with yeasts in counts ranged from 10^3 to$<10^4$/g, while, molds were existed in 12% of the samples in numbers ranged from <10 to $1.3x10^3$ with a mean value of $5x10^2\pm4.3$ x10/g. 50% of positive samples were contaminated with molds in counts ranged from 10^2 to$<10^3$/g.

Large scale dairy plants kareish cheese were the best product we examined and this was obvious in comparing our results with Egyptian Standards, we found that 96, 66 and 94% of the samples according to E.coli,

enterococci and Staph.aureus were agree with legal requirements. 58, 90 and 88% of samples were acceptable according to coliforms, yeasts and molds.

In Food Standards the results expressed that 94, 58 and 96% of the samples were acceptable according to Staph.aureus, E.coli and coliforms.

Regarding small scale producers kareish cheese, the results revealed that aerobic plate count ranged from $7x10^2$ to $2x10^4$ with a mean value of $1.06x10^4 \pm 5.8x10^2$ bacteria /g .The highest frequency distribution (56%) lies within the range of 10^4 to $<10^5$ /g. Psychrotrophs were detected in 98% of the samples at a level ranged from <100 to $9.1x10^3$ with a mean value of $3.6x10^3 \pm 3.8x10^2$ /g. The highest frequency distribution (79.6%) lies within the range of 10^3 to $< 10^4$ /g.

Enterobacteriaceae could be detected in 90% of samples .These organisms were existed in numbers varied from <10 to $5x10^3$ with a mean value of $1.8x10^3 \pm 1.3x10^2$ /g. Most of the positive samples (88.9%) lie within the range of 10^3 to$<10^4$/g.

31 (62%) of the examined samples were contaminated with coliforms. The majority of positive samples (48.4%) contained counts of 10^3 to $<10^4$ /g. Fecal coliforms could be detected in 52% of samples .The majority of positive samples (46.2%) had fecal coliforms within the range of 10^3 to $<10^4$ /g. E.coli were existed in 10% of samples. The highest frequency distribution (60%) of E.coli lie in between the range of 10^3 to $<10^4$ /g.

Enterococci could be detected in 84% of samples. They were existed in numbers varied from <100 to $3.9x10^4$ with a mean value of $3.6x10^3 \pm 3.8 x10^2$ /g. Most of the positive samples 40 (95.2%) lie within the range of 10^3 to$<10^4$/g. 20% of samples found to be contaminated with Staph.aureus. The

level of contamination varied from <100 to $4x10^3$ with a mean value of $2.4x10^2 \pm 1.06x10^2$/g. 60% lies within the range of 10^2 to $<10^3$/g.

60% of samples were contaminated with anaerobes. 34 (68%) of the samples contaminated with yeasts. The level of contamination varied from <10 to $1.8x10^3$ with a mean value of $3.4x10^2 \pm 5.8x10$ /g. The highest frequency distribution (91.2%) lies within the range of 10^2 to $<10^3$/g. 37 (74%) of samples contaminated with molds. The level of contamination varied from <10 to $1.5x10^3$ with a mean value of $4.9x10^2 \pm 6.2x10$/g. The highest frequency distribution (73%) lies within the range of 10^2 to $<10^3$/g.

According to Egyptian Standards small scale producers were somewhat better than farmers houses kareish cheese, we can notice that 38, 90, 16, 80, 94 and 26% of samples according to coliforms, E.coli, enterococci, staphylococci, yeasts and molds, respectively, were agreement with EOSQC standards.

In Food Standards, all samples had aerobic bacterial counts lower than 5×10^5/g which agree with these standards. Only 20, 62 and 10% of samples were above the legal requirements according to Staph.aureus, coliforms and E.coli count.

Our current results indicated that the aerobic plate count ranged from $1x10^4$ to $8.1x10^5$ with a mean value of $1.02x10^5 \pm 6.2x10^3$ /g of farmers houses kareish cheese. 51% of the examined samples lie in between 10^4 to $<10^5$ /g. while 49% of the samples lie within a range varied from 10^5 to $<10^6$ /g. Psychrotrophic count ranged from <100 to $1x10^5$ with a mean value of $3.4x10^4 \pm 2.7x10^3$ /g. It is worth to notice that most of positive samples 80.4% contained psychrotrophs within the range of 10^4 to $<10^5$ /g.

High incidence of enterobacteriaceae (100%) were detected. The count ranged from $3x10^3$ to $2\ x10^5$ with a mean value of $4.2x10^4 \pm 3.1x10^3$ /g. The highest frequency distribution of contamination (89%) of samples lies in between 10^4 to$<10^5$/g.

Coliforms could be detected in 98% of the examined samples. The majority of positive samples (70.4%) had counts within the range 10^3 to $<10^4$ /g. 95% of examined samples were contaminated with fecal coliforms it was found that the majority of positive samples (61%) had counts of 10^3 to $<10^4$ /g.

E.coli could be isolated from 21% of the examined samples. 80.9% of examined samples were contaminated with E.coli in between 10^3 to $<10^4$ /g.

The numbers of enterococci were counted in 99% of with a minimum of <100 and a maximum of $3x10^5$ with a mean value of $3.4x10^4 \pm 2.7x10^3$ /g. Out of 99 positive samples 83 (83.8%) had counts varied from 10^4 to $<10^5$/g. Staph.aureus could be isolated from 37% of the examined samples with minimum value <100, maximum value $2.8x10^4$ and with a mean value of $5.1x10^3 \pm 4.5x10^2$/g. In addition, the majority of samples (91.9%) were contaminated with Staph.aureus in between 10^3 to $<10^4$ /g.

Anaerobes could be detected in 81% of the examined samples. 100% of the examined samples were contaminated with yeasts. The level of contamination varied from $1x10^3$ to $4.5x10^4$ with a mean value of $1.4x10^4 \pm 1.03x10^3$ /g, the highest frequency distribution (67%) lies within the range of 10^4 to $<10^5$ /g. 94% of samples were contaminated with molds. The level of contamination varied from <10 to $2.9x10^4$ with a mean value of $5.8x10^3 \pm 5.2x10^2$ /g. The highest frequency distribution (76.6%) lies within 10^3 to$<10^4$/g.

When we compare our results with Egyptian Standards, we can find here to what extent the farmers houses kareish cheese samples were manufactured under unhygienic conditions, the results investigate that 96, 21, 99, 37, 100 and 94% of samples were unacceptable according to coliforms, E.coli, enterococci, Staphylococci, yeasts and molds microorganisms respectively, were not agree with EOSQC standards.

We also compare our data with Food Standards, coagulase positive Staph.aureus was present in high amounts in 37% of samples, 96 and 21% of samples had coliforms and E.coli more than the permissible limits.

Recommendations were suggested to control the presence of such organisms in the evaluated kareish cheese samples to avoid their undesirable changes that resulted in public health hazard.

Conclusion and recommendation

Kareish cheese is most popular dairy product in Egypt as it is widely consumed by all ages due to its high nutritive value and palatability. However, it may constitute a serious public health hazard as a result of contamination from various sources with different types of microorganisms during manufacturing, handling and storage.

From the obtained data, one can realize that large scale dairy plants kareish cheese, was contaminated with different types of microorganisms but with low incidence due to pasteurization of milk used in manufacturing, while, in small scale producers kareish cheese, all microorganisms were isolated in high percentages but somewhat lower than farmers houses kareish cheese and this may be due to heat treatment of milk applied during manufacturing.

Concerning farmers houses kareish cheese was highly contaminated with large number of aerobic microorganisms, psychrotrophic bacteria, enterobacteriaceae, coliforms and fecal coliforms. Likewise, high percentages of enterococci, yeasts and molds could be detected. However, E.coli and Staph.aureus were existed in numbers sufficient to be considered a public health hazard.

According to the standards recommended by EOSQC and Food Standards, most of farmers houses and small scale producers kareish cheese samples did not fulfill with these standards and considered of inferior quality. Such findings seems to be logic if we have looked to the method of preparation and lack of sanitary conditions under which this type of kareish cheese produced.

Production of kareish cheese is subjected to many risks of deterioration due to absence of pasteurization, bad quality ingredients and unsanitary methods of processing, storage and distribution. Therefore, production of safe and high quality foods with a minimum of contamination ranks a prime consideration of food hygienists.

It should be however, emphasized that the presence of these microorganisms in large numbers were considered as a reliable index of carelessness and unhygienic measures during preparation and other manufacturing steps.

In recent years the consumer awareness has played a predominant role in emphasizing the need for microbiologically safe foods for human consumption. Therefore, to improve the quality of dairy plants kareish cheese and to safeguard the consumer from being infected we should follow the following measures:

1- ***General guidelines:***

a- Floors of dairy buildings must be made of bard washable surface. Walls should be smooth and washable to about 2 meters from floor level and painted with light color.

b- Doors should be self shutting while windows should be rendered insect proof by mosquito netting to keep flies out.

c- Rooms should be kept clean and in good repair.

d- All product-contact surfaces should be kept cleaned immediately before use or as often as necessary, by cleaning techniques appropriate to the equipment and process.

e- Equipment and utensils should be disinfected immediately before use, and whenever there has been possibility of accidental contamination.

f- Equipment repairs and maintenance should preferably be carried out after processing. Whenever machines have to be fixed during production runs, adequate precautions should be taken to prevent contamination of dairy products.

g- Proper pasteurization of milk used in manufacturing of kareish cheese should be imposed in all factories.

2- Disinfection:

Disinfection of dairy equipment may be carried out by means of:

a- Steam - Steaming should be done for 10- l5 minutes after the condensate has attained 85˚C.

b- Hot water - Hot water at 80˚C (use soft water only to prevent deposition of salts) for at least 20 minutes in circulation cleaning for 15 minutes at 85˚C.

c- Detergents/disinfectants - used as part of the cleaning process at temperatures between 45-60˚C in manual cleaning and for cold milk lines, storage tanks and tankers.

3-Packaging:

i) Packaging materials should be:

- Stored in a dry place away from manufacturing areas.
- Used in a clean and sanitary manner.
- Non-toxic.

ii) Packaging should be carried out in away that:

- Avoids contamination of processed products.
- Protects the product against contamination until the product reaches the consumer

4- Personnel Hygiene and Health.

a- It is recommended that persons engaged in handling foods should be subjected to health checks in accordance with provisions of the Public Health laws of Egypt.

b- Factory premises should be provided with clean running water and good washrooms.

c- Workers should wear clean protective clothing and working gear (e.g. gum boots, coats, overalls and caps).

d- Clean, healthy employees who are industrious and quality minded of good characters and integrity with knowledge of the business and appreciation for laboratory facilities and quality control.

e- Educational programs should be imposed for producers and handlers to improve the quality of the produced milk and to insure a maximum safety to consumers.

5- Application of Food Standards:

a- Standards must be applied to all aspects of production, processing and distribution. These standards must be adequate to provide an acceptable product, without imposing unrealistic requirements.

b- Strict application of the general principles of food hygiene issue by the "Codex Alimentarius Commission" and should be practiced in all chain of milk and milk products manufacturing.

c- Application of new quality assurance programs such as "HACCP" system, which must be adopted in both milk production units, milk products processing plants, transportation and displaying the final products.

To improve the quality of Farmers houses kareish cheese and to safeguard the consumer from being infected we should follow the following measures:

1- The milkers hands and clothes are clean and he or she is in good health.

2- The milk storage equipment such as milk churns are kept clean and are in good condition (i.e. without cracks or dents which are difficult to clean and can easily harbor bacteria).

3- Washing and disinfection of the udder before milking.

4- Immediately after milking, the milk must be cooled preferably to 4C°. This requires milk cooling tanks. These are expensive and can usually be afforded by large scale commercial farms.

5- Using salt of good quality.

6- Avoiding use of raw milk and apply any heat treatment measures to the milk before using.

7- Handling and distribution should be done under strict hygienic measures.

8- The product may sold in bags to protect it from pollution.