

EVALUATION OF BACTERIOLOGICAL QUALITY OF INDIAN CHEESE (PANEER) SOLD IN NAGPUR CITY

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Abstract

Paneer is one such product which is a regular dietary favorite among the Indians. So the present study was aimed to assess the microbiological quality of Paneer sold in Nagpur city. A total of 32 samples were collected from various areas of Nagpur city. All samples were analysed for total viable count (bacteria) on nutrient agar and fungi on PDA. All samples were analysed for presence of *E.coli*, *Staphylococcus spp.* and *Salmonella spp.* Methylene blue reduction test was also performed. All the 32 samples had bacteriological counts ranging from 1×10^6 to 8.2×10^6 CFU/gm. And fungal counts ranging from 1×10^5 to 6.6×10^5 CFU/gm. Of all the samples *Staphylococcus spp.* was found in 97% of the samples. *E.coli* in 72% and *Salmonella spp.* were found in 34% of the samples.

The heavy bacterial and fungal contamination seen in all samples predominantly *Staphylococcus spp.* and fecal coliforms can be attributed to poor hygienic conditions during paneer preparation, handling and storage. The study suggests the need for more strict preventive and control measures to avoid pre and post process contamination in milk food products.

Key words : bacterial contamination, *E.coli*, Milk products, Paneer, *Staphylococcus Spp.*

INTRODUCTION

Paneer is a fresh cheese, which is usually prepared from buffalo milk, is widely used for preparation of various culinary dishes in India. The Indian cheese (Paneer) is a regular dietary favorite among the Indians. Being a high protein food, it is an excellent substitute for meat in the diet in a vegetarian cuisine. There are many steps in the manufacture, handling and storage of paneer in which it can get contaminated with microorganisms.

The quality of shelf life of goat milk paneer in refrigerated storage was reported earlier [1], and it was observed that even during storage at refrigerated conditions. The products are found to be contaminated. In another study the microbiological quality of dairy product Pedha was reported and the quality could be improved by gamma radiation [2]. A study on bacteriological study of paneer sold in Chandigarh city had also shown the samples to be highly contaminated [7]. In tropical countries like India, dairy products are responsible for many outbreaks of gastro intestinal infection. The products prepared under unhygienic conditions pose a great threat to the health of the consumers.

A study was conducted to assess microbiological quality of paneer samples sold in Nagpur city with a view to analyze the situation locally.

MATERIALS AND METHODS

A total of 32 samples of paneer were collected from different shops in various areas of the city. 9 samples from shops of east zone, 6 from south zone, 6 from west zone, 6 from central zone and 5 from north zone were collected. The last three samples were packaged paneer samples. The samples were collected in presterilized containers and transported to the lab in ice bucket.

All the samples were processed as follows under sterile conditions. The sample was crushed finely in pestle and mortar. 1gm of sample was mixed thoroughly in 10ml autoclaved saline and mixed thoroughly by vortexing. Serial dilutions from the above suspension were prepared up to 10^{-6} . 1 ml serially diluted sample was plated by pour plate technique on nutrient agar (for total viable count), Potato Dextrose Agar (for yeast and mold count), Xylose Lysine Deoxycholate agar and Bismuth Sulfite Agar for *Salmonella spp.*, EMB and Mc Conkey agar for *E.coli*, Baird Parker Agar for *Staphylococci spp.* All plates were incubated at 37°C for 24-48 hrs.

After 24-48 hours of incubation the plates were observed for typical colonies of each microorganism and colonies were counted with the help of colony counter. The results were recorded as CFU/gm.

Biochemical test performed were IMViC test, catalase test, urease test, oxidase test and sugar fermentation tests.

RESULTS AND DISCUSSION

The sampling locations of paneer samples from various zones of Nagpur city are shown in Table 1.0

The samples were collected randomly from various shops from different zones of Nagpur city. The findings in the present study indicate that all samples of paneer collected from different parts of the city were highly contaminated with bacteria and fungi. All the 32 samples studied had bacteriological counts ranging from 1×10^6 to 8.2×10^7 CFU/gm and fungal counts ranging from 1×10^5 to 6.6×10^6 CFU/gm. The samples were found to be contaminated with *Staphylococcus spp.*, *Salmonella*, *E.coli* in 97%, 34% and 72% of the samples respectively. Table 2.0 shows the results of the microbiological analysis of paneer samples.

In the present study a high degree of bacterial contamination has been seen. The occurrence of *Staphylococcus spp.*, *Salmonella spp.* and *E.coli* in almost all the paneer samples collected may be attributed to the practice of preparing large bulks far too in advance of requirement which are being held for long periods at room temperature. Studies carried out on microbial quality of paneer have indicated that it is often contaminated with *Staphylococcus aureus* and coliforms [4, 5]. It also indicates poor hygienic conditions and faults in manufacturing/handling during the process of preparation. It is observed that most of the times the vendors in various sectors of the city and workers in the shop have

no knowledge of the practices and probable dangers if a food safety is not followed. The application of HACCP to identify the critical control points for coliforms and *Staphylococcus spp.* has indicated that the contamination is due to food handlers using bare hands to remove excess water in paneer [3].

In India quality control with regard to food products is being enforced through various regulatory mechanisms like prevention of food adulteration Act (FPA), Agricultural grading and marketing (AGMARK), fruit products order (FPO). The Bureau of Indian standards (BIS) has launched a HACCP program of certification for the food industry [7], while efforts are being made to implement HACCP in the organized sector of the food industry, there is a need to implement HACCP in the unorganized sector also, as it accounts for 70-80% of food produced and processed in India. Thus in the context of globalization and post WTO era, the codex Alimentarius commission guidelines on food safety issues such as HACCP should be implemented in India. Table 3.0 shows the Indian standards specifications for paneer (IS : 10484-1983).

The code of conduct laid down by BIS should be strictly followed by the paneer manufacturers. Government agencies and NGOs could take initiative in spreading awareness and measures to educate the workers about the manufacturing handling and selling of such products which have a very high risk of getting contaminated during the entire process, and basic training of handling and hygienic practices can be given to the manufacturers and handlers, so that the health of the consumer is not at risk.

Table 1.0: Sampling locations of paneer samples from various zones of Nagpur city.

Sample Number	Zones
P1 to P8	East Zone
P9 to P12	South Zone
P13 to P18	West Zone
P19 to P24	Central Zone
P25 to P29	North Zone
P30 to P32	Packaged paneer samples

Table 2.0: Enumeration of Total Bacterial viable Count, Fungal Count, *Staphylococci*, *Coliforms* and *Salmonella* in Paneer samples from Nagpur city

Sr.No.	Paneer sample	N.A. (TBVC)	PDA (TFC)	BPA (TSC)	EMB (TC)	McA (TC)	BSA (<i>Salmonella</i>)	XLD (<i>Salmonella</i>)
1	P1	14X10 ⁶	35X10 ⁵	59X10 ³	4X10 ³	3X10 ³	-	-
2	P2	57X10 ⁶	28X10 ⁵	51X10 ³	19X10 ³	46X10 ³	+	+
3	P3	34X10 ⁶	25X10 ⁵	82X10 ³	58X10 ³	55X10 ³	+	+
4	P4	48X10 ⁶	21X10 ⁵	62X10 ³	39X10 ³	36X10 ³	+	+
5	P5	1X10 ⁶	6X10 ⁵	17X10 ³	3X10 ³	0	-	-
6	P6	6X10 ⁶	11X10 ⁵	81X10 ³	3X10 ³	5X10 ³	-	-
7	P7	9X10 ⁶	1X10 ⁵	10X10 ³	0	0	-	-
8	P8	15X10 ⁶	2X10 ⁵	14X10 ³	11X10 ³	20X10 ³	-	-
9	P9	19X10 ⁶	1X10 ⁵	263X10 ³	31X10 ³	46X10 ³	-	-
10	P10	11X10 ⁶	2X10 ⁵	96X10 ³	15X10 ³	32X10 ³	-	-
11	P11	3X10 ⁶	18X10 ⁵	95X10 ³	24X10 ³	10X10 ³	-	-
12	P12	68X10 ⁶	30X10 ⁵	82X10 ³	7X10 ³	1X10 ³	+	+
13	P13	29X10 ⁶	14X10 ⁵	0	17X10 ³	22X10 ³	+	+
14	P14	41X10 ⁶	7X10 ⁵	114X10 ³	38X10 ³	11X10 ³	+	+
15	P15	9X10 ⁶	32X10 ⁵	19X10 ³	18X10 ³	10X10 ³	-	-
16	P16	23X10 ⁶	30X10 ⁵	156X10 ³	3X10 ³	1X10 ³	-	-
17	P17	24X10 ⁶	17X10 ⁵	18X10 ³	0	0	-	-
18	P18	64X10 ⁶	50X10 ⁵	95X10 ³	0	0	-	-
19	P19	20X10 ⁶	17X10 ⁵	88X10 ³	57X10 ³	57X10 ³	+	+
20	P20	23X10 ⁶	1X10 ⁵	91X10 ³	31X10 ³	35X10 ³	+	+
21	P21	82X10 ⁶	66X10 ⁵	11X10 ³	42X10 ³	56X10 ³	-	-
22	P22	20X10 ⁶	42X10 ⁵	3X10 ³	0	0	-	-
23	P23	37X10 ⁶	27X10 ⁵	148X10 ³	38X10 ³	11X10 ³	-	-
24	P24	14X10 ⁶	6X10 ⁵	88X10 ³	0	0	-	-
25	P25	39X10 ⁶	33X10 ⁵	19X10 ³	40X10 ³	127X10 ³	+	+
26	P26	0	0	16X10 ³	0	0	-	-
27	P27	20X10 ⁶	18X10 ⁵	124X10 ³	0	0	-	-
28	P28	56X10 ⁶	21X10 ⁵	28X10 ³	30X10 ³	26X10 ³	-	-
29	P29	37X10 ⁶	14X10 ⁵	52X10 ³	7X10 ³	15X10 ³	+	+
30	P30	5X10 ⁶	14X10 ⁵	54X10 ³	0	0	-	-
31	P31	12X10 ⁶	9X10 ⁵	6X10 ³	0	0	-	-
32	P32	34X10 ⁶	32X10 ⁵	54X10 ³	46X10 ³	28X10 ³	+	+

Abbreviations: NA-Nutrient Agar, TBVC- Total Bacterial Viable Count, PDA- Potato Dextrose Agar, TFC- Total Fungal count, BPA- Baird Parker Agar, TSC- Total Staphylococcal Count, EMB- Eosine Methylene Blue Agar, TC- Total Coliforms, McA- Mac Conkey Agar, BSA- Bismuth Sulfite Agar, XLD- Xylose Lysine Deoxycholate Agar

P1-P32- paneer samples 1 to32

Table 3.0: The Indian standards specifications for paneer (IS : 10484-1983)

Sr.No.	Characteristics	Requirement	Method
1.	Bacterial count per gram max.	5x10 ⁵	Is : 5402-1969
2.	Coliform count per gram max.	90	Is:5401-1969
3.	Fungal count per gram max	250	Is:5403-1969

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