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Bacterial count of paneer prepared from blend's of raw turmeric extract and buffalo milk

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Abstract
Paneer is an important nutritious and wholesome indigenous dairy product, which occupy a prominent place among traditional milk products. Turmeric became a very important spice to mankind when it was observed that the addition of turmeric in food preparation preserved its freshness and nutritive value. Curcumin is a bioactive substance of turmeric and posing as a very strong anti-bacterial, anti-septic, anti-spasmodic, antifungal, anti-allergic anti-oxidant properties. In present investigation bacterial count of *paneer* studied which includes. The *paneer* was prepared by considering treatment combination of buffalo milk and raw turmeric extract as 95%, 90% and 85% of buffalo milk and 5%, 10% and 15% of raw turmeric extract in treatments T_2, T_3 and T_4 and treatment T_1 taken as a control prepared from buffalo milk only. The fresh raw turmeric extract added *paneer* was blank for yeast and mould and the coli form was not found in all treatment.

Keywords: Bufalo milk, paneer, channa, raw turmeric, *Curcuma longa*

Introduction
Paneer is rich source of animal protein available at a comparatively lower cost and forms an important source of animal protein for vegetarians. Over and above its high protein content and digestibility, the biological value of protein in *paneer* is in the range of 80 to 86 (Shrivastava and Goyal 2007) [10]. According to the FSSAI rules, chhana or *paneer* is defined as a milk product obtained by precipitating a part of milk solids by boiling whole milk of cow and or buffalo or a combination thereof by addition of lactic acid, citric acid or any other suitable coagulating agent and subsequent drainage of whey (FSSAI, 2006) [2]. Herbs and spices have therapeutic properties such as antioxidative, anti-inflammatory, antidibtic, anti-hypertensive and anti-microbial activities. Therefore, fortification of dairy food with herbs and spices could help to provide functional dairy products with nutritional and medicinal values. Therefore only the highest quality herbs or spices can be added to dairy products to combat contaminating microorganisms (Samah and Youssef 2019) [9].
Turmeric is one of the greatest beneficial medicinal plants in the entire world and it's also one of the most researched medicinal plants in history. Curcumin is a bioactive substance of turmeric. Curcumin fights inflammation at the molecular level and is the main active ingredient posing as a very strong anti-bacterial, anti-septic, anti-spasmodic, antifungal, anti-inflammatory, anti-allergic anti-oxidant, anti-mutagenic, anti-carcinogenic, astringent, carminative, cholagogue, digestive diuretic, stimulant and vulnerary (Vyas *et al.* 2015) [11]. Turmeric is a rich source of numerous biologically active constituents such as polyphenols, sesquiterpenes, diterpenes, triterpenoids, sterols, and alkaloids Gupta *et al.* (2013) [3].
In present investigation an attempts was made to study yeast mould and coliform count in *paneer* prepared from blends of buffalo milk and raw turmeric extract.

Material and Methods
Buffalo milk and raw turmeric
Already standardized fresh Buffalo milk was procured from local market of Latur city, of Natural Milk Pvt., Ltd., Latur having 6.0 per cent fat and 9 per cent SNF. The pure raw turmeric (Selam variety) required for preparation of *paneer* was obtained from local market of Latur city.

Chemicals
Analytical (AR) or guaranteed grade (GR) reagents were used in the chemical analysis.

Packing Material
Polythene bags (200 gauges) was obtained from local market and used for packaging the raw turmeric added *paneer*.

Equipment and Accessories
Equipments and accessories include stainless steel vessels of requisite capacity, knives, fruit extractor/mixture, muslin cloth, standard weight balance, thermometer, gas shegdi, *paneer* press machine, etc. used for preparation of *paneer*. Before using this material, it was properly cleaned and washed with detergent solution and all the precautionary measures was considered during the conduct of trials to avoid contamination.

Preparation of raw turmeric extract
The fresh raw turmeric was collected, washed, peeled and cut into small pieces. After cutting raw turmeric pieces were grinded in the mixer for homogenous fine mixture by adding 1:5 ratio of water for extract filtration through muslin cloth.

Preparation Buffalo milk *Paneer* blended with Raw Turmeric extract
The buffalo milk (6% fat and 9% SNF) was taken in pan then raw turmeric extract was added before heating and mixed properly through glass rod. Milk was heated to 86 °C and cooled up to temperature 76 °C. After cooling citric acid were added in milk @ 1-3 % at 76 °C with stirring. After complete coagulation the stirring was stopped and allow the curd to sink to the bottom. The whey was then drained through a stainless steel strainer. The curd was collected and filled in stainless steel *paneer* hoope. The hoope used was circular blocks with holes on its side to facilitate the expulsion of whey. *Paneer* was pressed 10-15 minutes @ 3 kg/sq cm. The pressed block of curd was removed from the hoop, cut into pieces and immersed in chilled water (4 °C) for 2 to 3 hours. The chilled *paneer* was then removed from water to drain out and packed in polythene bag and finally storage in refrigerator (5 °C).

Microbiological properties
A) Yeast and mold count
Raw turmeric extract added *paneer* was ascertained for yeast and mold counts as per suggested by Marshall (1993) [6] using Potato Dextrose Agar and pH of media adjusted to 3.5±0.1using tartaric acid solution. The prepared plates were incubated at 30 °C for 3-5 days and counts were expressed as log cfu per ml of sample.

B) Coli form count (CFC)
Enumeration of coliform count of *paneer* was determined by using pour plate method described by Hought *et al*. (1992) [4] employing Violet Red Bile Agar (pH 7.4±0.1). The prepared plates were incubated at 37 °C for 48 hr. Colonies with dark red coloration were counted and they were expressed as log cfu per ml of sample.

Result and Discussion
Microbial Analysis
The fresh product prepared was subjected to microbiological analysis with respect to yeast and mould count and coli form count. The microbial analysis of *paneer* was carried out according to Ranganna (1986) [8]. One ml of each of the sample was taken and to this 9 ml of 0.5% saline was added and then further diluted to four folds. 1 ml of each from appropriate dilution was plated in required medium and then incubation was carried out. In each count, after incubation, the average count of colonies present on Petri plates were multiplied by dilution factor and expressed as cfu/g of sample.

Yeast and mould count of raw turmeric extract added fresh *paneer*
Table no. 1 indicates the yeast and mould count of *paneer* prepared from raw turmeric extract blended with buffalo milk. The yeast and mould was found in control treatment only which had count 1.0 cfu/gm in each. The fresh raw turmeric extract added *paneer* was blank for yeast and mould. It was seen that the yeast and mould count remained within the limit (maximum 100 c.f.u./gm) suggested by Marshall. Indicates that all treatments were prepared at hygienic condition and in raw turmeric extract added *paneer* samples were found absent for yeast and mould might be effect of turmeric extract having anti-microbial property (Niranjan and Dhan 2008 and Ikpeama *et al*. 2014) [7, 5].

Table 1: Yeast and mould count of fresh raw turmeric extract added *paneer* (cfu per gm)

Treatment	Replication				
	R-I	R-II	R-III	R-IV	Mean
T_1	1.00.	2.00	1.00	0.00	1.00[a]
T_2	0.00	0.00	0.00	0.00	0.00[b]
T_3	0.00	0.00	0.00	0.00	0.00[b]
T_4	0.00	0.00	0.00	0.00	0.00[b]
SE ± 0.00CD at 5 % 0.00					

The values with different small letters superscripts row wise differ significantly at 5 per cent level of significance.

Agnihotri and Pal (1995) [1] studied that freshly prepared *paneer*. During refrigerated storage at 4±1ºC for 0, 3 and 7 days, there was no significant change (P<0.05) in pH and moisture content of *paneer* the initial standard plate counts (3.94±0.41)), proteolytic bacteria (3.34±0.11)), *Staphylococcus* spp. (2.90±0.23), psychotropic bacteria (2.22±0.21), and yeast and mold counts (< = 1.0 $\log_{10}$ cfu g^{-1}) in *paneer*, revealed marked increased after day 3 of storage. Respective counts on day 7 of refrigerated storage reached levels of $\log_{10}$ 6.08±0.76, 5.26±0.73, 4.90±0.93, 4.26±0.43, 2.6±1.10 cfu g^{-1} of *paneer*.

Coliform count of raw turmeric extract added fresh *paneer*
Appropriate dilution of samples were made and transferred to sterile petriplates, pour plating was done using Mac conkey agar, pH 7.4; Plates were incubated at 37 °C for 48hour.

Table 2: Coli form count of raw turmeric extract added fresh *paneer*

Treatment	Replication				
	R-I	R-II	R-III	R-IV	Mean
T_1	N.D.	N.D.	N.D.	N.D.	N.D.
T_2	N.D.	N.D.	N.D.	N.D.	N.D.
T_3	N.D.	N.D.	N.D.	N.D.	N.D.
T_4	N.D.	N.D.	N.D.	N.D.	N.D.
SE ± 0.00 CD at 5 % 0.00					

(N.D. = Not detectable)

The Table 4.20 shows the coli form count of fresh raw turmeric extract added *paneer*. The coli form was not found in all treatment. The raw turmeric extract added *paneer* was blank for coli form count. All treatments were prepared at hygienic condition and at par to each other.

Agnihotri and Pal (1995) [1] studied that freshly prepared *paneer* and found coli form counts (most probable number (MPN) presumptive) from its initial value of 22.01±3.75 reached 1445.40±584.59 on day 7 of storage.

The heat treatment given to milk is more than enough to destroy all the pathogenic and spoilage microorganisms. Thus it is the contamination either during or post manufacturing which is responsible for this spoilage. Coli form was found to be absent due to *paneer* could be produced under hygienically condition.

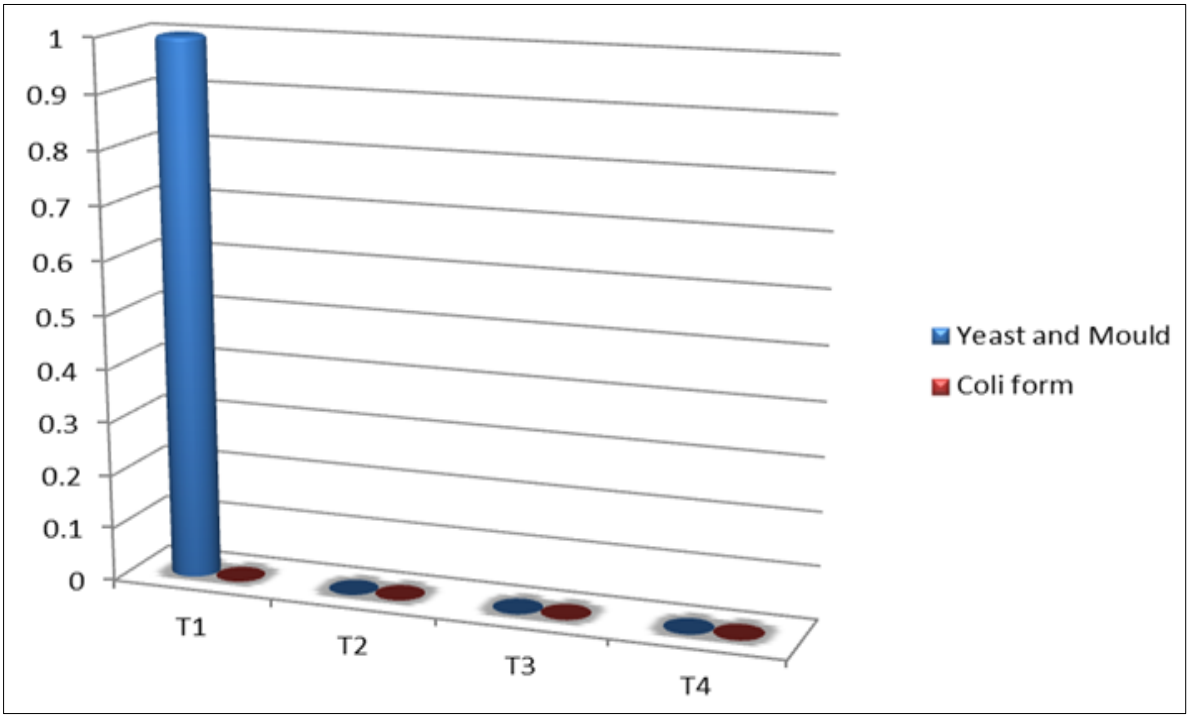

Fig 1: Geographical representation for Microbial Analysis of Raw Turmeric Extract Added *Paneer*.

Conclusion

All treatments of raw turmeric extract added *paneer* samples were found absent for yeast and mould due to effect of turmeric extract having anti-microbial property and in control sample only 1.0 cfu/gm. The coliform count for control and raw turmeric added *paneer* was not found.

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