Analysis of Traditional Turmeric Milk Concentrations in Intensifying Shelf life of Raw Milk through Physiological, Microbiological and Biochemical Parameters.

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A. MOHAMMED AHSAN

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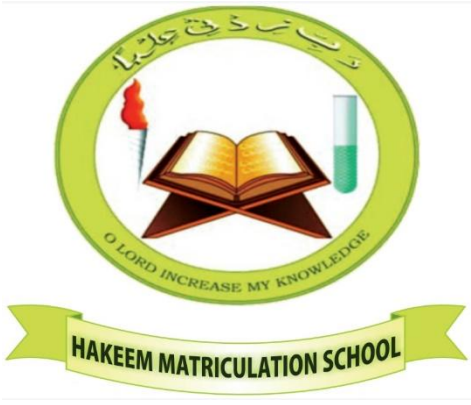

HAKEEM MATRICULATION SCHOOL

281,TRIPLICANE HIGH ROAD,CHENNAI-600005

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Abstract

The raw milk sample collected directly from cow through milk man may be contaminated with microbes through various sources. The present work holds systems thinking which collaborate the studies on shelf life of milk through physiological, microbiological and biochemical parameters. Various turmeric concentrations on the milk sample presented preservation for raw milk at 0.1gm for 50ml of sample taken. MBRT test revealed that the milk sample with 0.1gm of turmeric can be kept for 2.30 hours without any alteration in its quality and is proved to be a vital technique in the absence of any refrigerated conditions. The SPC presented very few colonies which were less than 30 considering the standard plate count value of 30-300. The sample was assayed for its bacterial load was found to be Gram positive in nature. Biochemical test for identification of bacteria predicted the presence of Lactobacillus species which was found to be active after the time interval of preservation.

Introduction

Milk is considered to be a unique secretion of mammary glands, with all the essential nutrients that enriches and fulfil the nutritional requirements of offspring. Chemically, milk is considered to be constituted of more than 100 separate entities that varies within species. Milk is considered to be an opaque white fluid having various constituents in a colloidal suspension or solution upon a physical point of view. The physicochemical behaviour and chemical makeup provide an explanation and forms the basic criteria for milk processing and it's by products. Milk that draws from any animal is considered to be sterile, without any bacterial content. The need for safety measures to keep it sterile starts from the point it leaves the udder of animal.

Microorganisms that are capable of contaminating milk are prevalent in nature making it unsuitable for processing and unfit for consumption. There is the traditional practice of boiling the raw milk within hours of production which provides safety but not minimizing the microbial load. Increasing raw milk storage time prior to pasteurization may affect product shelf life. Raw milk was stored at 4.5ºC for 0, 2, 4 and6 days prior to pasteurization. Milk samples from each pasteurized lot were analysed after continuous storage at 4.5ºC. The raw and pasteurized samples were analysed for

coli forms, psychotrographs and total bacteria count. Flavour scorer were also determined.

No correlation were significant between raw and pasteurized samples and total bacteria or coli form counts. Related were flavour score and days held raw. Psychotropic counts and age of the raw milk were correlated from correlations of flavour scores with shelf life of milk a predictive equation is performed for analysis. Species belongs to Bacillus has got a tremendous role in keeping quality of milk samples. The organism can survive high temperature which was used for processing of food samples.

Reducing substances formed by the microbes as their metabolites are the key reason behind the change in colour formed by MBRT. The quicker disappearance of colour is directly proportional to the total number of bacteria. This is a true indication of the total metabolic reaction proceeding in the surface of bacteria.

Some may retain conventional pasteurization technique thereby extend the shelf life of milk through HTST Pasteurization techniques. The method may enable a shelf life of 14 to 28 days depends on the quality of raw milk samples prior to pasteurization. There is the second process which extends the shelf life through UP, Ultra pasteurization where the milk is heated to 280 ºC for 2 seconds.

Turmeric holds multiple medicinal properties and is considered to be as a natural preservative. Turmeric milk is healthy and is

considered to be as a golden remedy diet for many ailments. Curcumin, the polyphenol from turmeric is a good aid in controlling inflammation.

Turmeric milk relieves joint pains. The natural preservative turmeric, is considered to be rich in antioxidants, which can protect your body from damages caused by free radicals. Turmeric holds the ability to control blood sugar levels and boost immunity as well as brain functions. The present work aims to assess the antibacterial property of turmeric that can preserve milk.

Statement of the problem

Investigate the effectiveness of traditional turmeric milk in extending the shelf life of raw milk by analyzing its impact on microbiological, biochemical, and sensory parameters.

Hypothesis

Turmeric has antimicrobial properties that can inhibit the growth of microorganisms in milk, extending its shelf life.

Research Questions

1. Does turmeric milk exhibit antimicrobial properties against common milk-borne pathogens?
2. Can turmeric milk extend the shelf life of raw milk by inhibiting microbial growth and spoilage?
3. How does turmeric milk affect the biochemical composition of raw milk during storage?

Design of study

Dependent variable for analysis of traditional turmeric milk

- Physiological parameters
- Microbiological parameters
- Biochemical parameters
- Nutritional parameters
- Shelf life parameters

Independent variables for analysis of traditional turmeric milk

- Preparation methods
- Storage conditions
- Processing techniques
- Raw material variations

Control variables for analysis of traditional turmeric milk

- Raw milk sample without any turmeric milk added

Materials

1. Milk
2. Turmeric
3. Test tube or agar plates
4. Incubator
5. Bacteria or microbial culture

Methods

Methylene Blue Reductase test After a prompt sterilization of all utensils, 1 ml of methylene blue was added to the test tubes which are followed by the addition of 10ml of milk. An incubation period of 10 minutes will be provided under 35 ºC. A uniform creaming is created when temperature reached 36 ºC with slow inversion of the tubes. Special precautions are followed, not to shake the tubes. The tubes were covered to keep out from light. The samples were checked for discoloration after 30 minutes and subsequent changes were noted. The reduction time in whole hours between sample addition and discoloration were recorded.

Activity of Turmeric

Turmeric milk solutions of varying concentrations were prepared and the methylene blue reductase tests were performed. The assay was performed under different concentrations of turmeric and

different milk dilutions as well as comparing with different quantities of the milk sample.

Standard Plate count

0.1ml from the serially diluted samples were transferred to petri plates. The nutrient agar plates were then overlayed with second layer media and the same was incubated for 24 hours under 37 ºC.

Gram's staining

Standard Protocol of Gram's stain was applied on to the respective table.

Biochemical Analysis

Various Biochemical analysis were performed for the assay of the bacterial load as per the standard protocols.

Results

A milk sample without the addition of turmeric was taken as control which makes a comparison of the colour change occurred. Upon the addition of 0.1g on50ml of milk sample there observed a 35% reduction in the color which can be assumed as the preservation property of turmeric on milk samples.

Table 1: MRBT on raw milk sample at 5 hours

S.no	Type of sample	Concentration of turmeric	Qty	Observations
1.	Plane raw milk	nil	200 ml	80% colour change
2.	Plane milk	0.1g	200 ml	40% colour change
3.	Plane milk	0.2g	200 ml	40% colour change
4.	Plane raw milk	nil	150 ml	80% colour change
5.	Plane milk	0.1g	150 ml	40% colour change
6.	Plane milk	0.2g	150 ml	40% colour change
7.	Plane raw milk	nil	100 ml	80% colour change
8.	Plane milk	0.1g	100 ml	40% colour change
9.	Plane milk	0.2g	100 ml	40% colour change
10.	Plane milk raw	nil	50ml	80% colour change
11.	Plane milk raw	0.1g	50ml	40% colour change
12.	Plane milk raw	0.2g	50ml	35% colour change

Table 2: MRBT on pasteurized milk sample under varying concentrations of turmeric at 50ml of sample taken at 5 hours

S.no	Type of milk	Turmeric concentrations	Quantity of sample	Analysis
1.	Plane milk	nil	50ml	No change
2.	Milk sample 1	0.1g	50ml	No change
3.	Milk sample 2	0.2g	50ml	No change

The pasteurized milk samples as indicated in table 2 were analyzed under MBRT assay which makes a comparison with raw milk samples. Pasteurized samples never showed any change.

Table 3: MBRT ON RAW MILK SAMPLES AT 2 HOURS 30 MINUTES

S.No	TYPES OF SAMPLE	CONCENTRATION OF TURMERIC	QUANTIY	OBSERVATION
1.	Planemilk raw	nil	50ml	60% colour change
2.	Plane milk sample	0.1g	50ml	10% colour change
3.	Plane milk sample	0.2g	50ml	Very slight colour change
4.	72℃ heated and cooled milk sample	nil	50ml	25% colour change
5.	72℃ heated and cooled milk sample	0.1g	50ml	No colour change

The raw milk samples were assayed for 2 hours 30 minutes (table 3) . 50 ml of sample was taken for the experiments. It was reported that raw milk sample upon MRBT showed 60% colour change. The result reveled exiting when the sample was added with 0.1g of turmeric which showed only around 10% of colour change and presented with a very slight colour change when it was added on with 0.2g . the raw milk was heated on to 72° and was cooled and MRBT was performed which showed a 25% colour change and when the same was added with 0.1g turmeric, no change in colour was obtained.

Table 4: grams staining on various types of samples at 5 hours

The various samples were subjected to microbiological assays (table 4). The

S.no	Characteristic of culture pate used	Type of bacteria
1.	Plane milk pasteurized	Nil
2.	Raw mik	Gram +ve bacillus
3.	Raw milk heated and cooled	Gram +ve bacillus
4.	Effect of turmeric on milk	Gram +ve bacillus

raw milk and turmeric milk showed the presence of gram + ve bacillus followed by gram staining.

Table 5: biochemical analysis on various samples

S.No	Type of sample	Indole	MR	VP	Catalase	Citrate
1.	Plane milk	-ve	-ve	+ ve	+ ve	+ ve
2.	Milk heated and cooled	-ve	+ ve	+ve	-ve	+ ve
3.	Raw milk with 0.1g turmeric	-ve	+ ve	+ ve	-ve	+ ve
4.	Raw milk	-ve	+ ve	+ ve	-ve	+ ve
5.	Raw milk with 0.2g turmeric	-ve	+ ve	+ ve	-ve	+ ve

The Biochemical test was performed after the gram stain to reveal the presence of type of bacteria in the samples. Indole, Methyl Red, Voges Prausker,
Catalase, and Citrate tests were performed . The results were depicted above
(Table 5). All the type of samples showed citrate positive and all showed indole negative. When the milk were treated with turmeric, it showed a -ve result for indole test and positive result for MR test which was followed by -ve result for VP and -ve for catalase.

Table 6: the criteria for the grading of milk as per standard protocol is considered

Time	Quality of milk
5 hours and above	Very good
3 to 4 hours	good
1 to 2 hours	fair
Less than 1/2 hours	poor

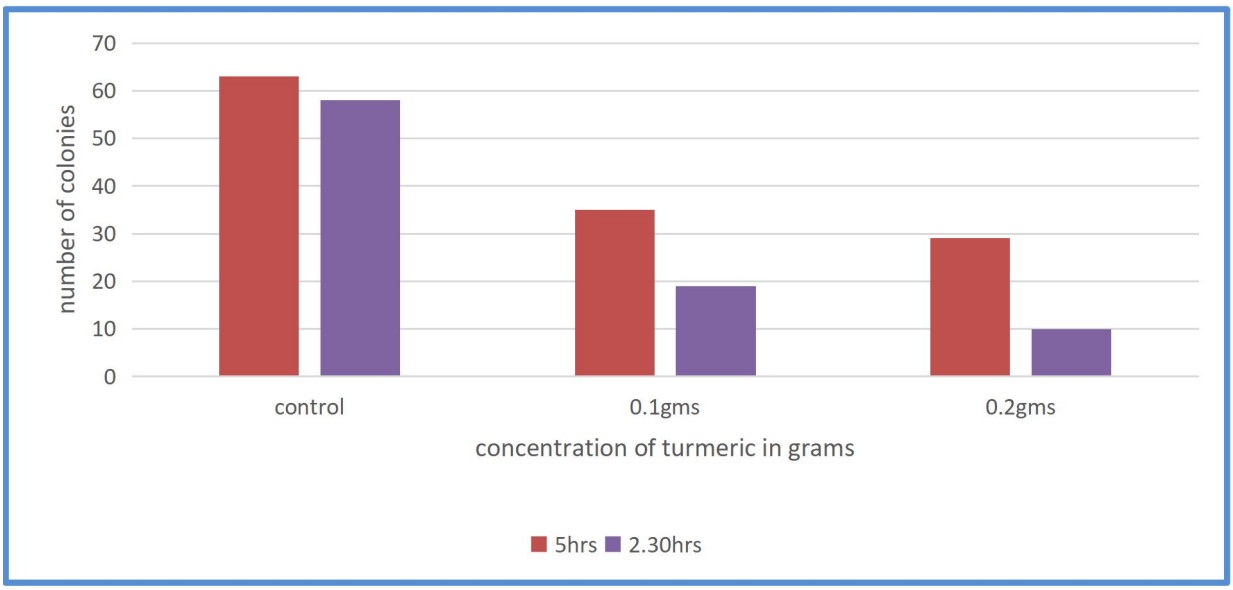

Fig:-1 (Standard Plate count of 50ml milk sample for bacteria under varying concentration of turmeric at 5 hours and 2.30 hours)

The standard Plate Count was performed of all the samples for bacteria under varying concentration of turmeric after 5 hours of incubation time. The standard Plate count showed 64 colonies on raw milk sample and 35 colonies only when it was treated with turmeric and which was considerably reduced to 29 when

treated with 0.2g turmeric.

CONCLUSION

The Raw milk sample collected was assayed for its biochemical, microbiological and kinetic parameters. It is interpreted (Table 1) that there is no correlation between quantity of milk and its decay.0.1g and 0.2 g of turmeric was added on to different quantities of raw milk samples and MBRT was performed. MBRT test result presented a 40% color change when the turmeric milk was kept for 5 hours (Table 1) and showed approximately 10% color change when the same was incubated under 2 hours 30 minutes (Table 3).Gram staining which was performed after 2 hours 30 minutes of sample presented the presence of a gram positive strain which may degrade the quality if kept in the room temperature for some more time (Table 4).Biochemical test predicted the presence of

lactobacillus strain which showed to be active after 2 hours and 30 minutes of turmeric milk. The standard plate count revealed remarkable results as it compared the turmeric milk of varying concentrations and raw milk (Fig 1) . the turmeric milk sample presented only 19 colonies under 0.1g which confirmed the efficiency of turmeric as a good preservative to enhance the shelf life of raw milk sample without any refrigerated condition.

Applications

Food preservation: a natural low cost method to delay spoilage of raw milk for rural households or small dairy farms using turmeric's anti micro bacterial properties.

Safety and health: potential reduction of harmful microbes could lower risk of food borne illness.

Economic: extending shelf life could reduce milk wastage and save money for consumers.

Nutritional: turmeric adds anti inflammatory compounds to milk, possibly enhancing its health benefits.

Future enhancements:

- ❖ Optimize turmeric concentration and exposure time for maximum shelf – life boost while preserving taste and nutrients.
- ❖ Test pasteurized vs raw milk to see if the effect differs.
- ❖ Investigate specific bio-active compounds responsible for antimicrobial activity.
- ❖ Scale up to small farm or commercial dairies with safety validations.
- ❖ Combine with other natural preservatives like ginger or neem for synergistic effect.
- ❖ Conduct sensory panel studies to assess consumer acceptability.

Benefits of traditional turmeric milk :

1. Anti-inflammatory – Curcumin in turmeric helps reduce inflammation and may ease joint pain.
2. Antioxidant-rich – Fights free radicals, supports overall cell health.
3. Digestive aid – Warm milk with turmeric can soothe the gut and improve digestion.
4. Immune boost – Combo of turmeric, ginger, and milk may strengthen immunity.
5. Sleep support – Warm milk is calming; turmeric's compounds may help relax the body for better sleep.

Benefits of analyzing Traditional Turmeric Milk :

1. Quality control – Ensures consistent curcuminoid levels for efficacy & taste.
2. Safety assurance – Detects contaminants, microbial load, or adulterants.
3. Nutrient profiling – Identifies vitamins, proteins, fats, and bioactive compounds.
4. Shelf-life prediction – Helps understand stability (e.g., sedimentation, oxidation).
5. Product development – Guides formulation tweaks (flavor, health claims, fortification).
6. Standardization – Supports regulatory compliance & labeling accuracy.

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