

Bacteriological and Compositional Comparison of Milk and Dung from House-Fed and Farm-Fed Dairy Cows

Champa Tolia¹; Khushi Joshi²; Amrapali Rai³; Saloni Sharma⁴; Aditi Thakur⁵

^{1,2}Rapture Biotech PVT Ltd, Dehradun

³Bhabha University, Bhopal

⁴JECRC University, Jaipur, Rajasthan

⁵Sharda University, Greater Noida, Uttar Pradesh

Publication Date: 2026/10/13

Abstract: The study compared a variety of bacteria contained in both cow milk and cow dung collected from house feeding and farm feeding systems for selected microorganisms including *Streptococcus*, *Staphylococcus*, *Escherichia coli*, *Lactobacillus*, *Enterobacter*, *Proteus vulgaris*, *Klebsiella oxytoca*, and *Bacillus subtilis*. The results of the study indicate, for both house feeding and farm feeding, that both the milk and the dung supported microbial growth, however, the amount and types of microorganisms present depended not only on feeding practices but also on exposure to the environment and hygiene conditions. Cow milk collected from house feed cows contained, predominantly, only *Streptococcus*, *Bacillus* spp., and *Lactobacillus*, while cow milk collected from farm feed cows had an abundance of *Staphylococcus* and *E. coli*. Cow dung collected from house feed cows had high numbers of *Staphylococcus*, *Enterobacter*, and *Lactobacillus* while dung collected from farm feed cows had high numbers of *Proteus vulgaris*, *Klebsiella oxytoca*, and *Bacillus subtilis*. Additionally, the study revealed that there are both beneficial and detrimental types of bacteria in both cow milk and cow dung that provide beneficial support for gut health, aid in decomposition processes, and contribute to the fertility of the soil, however, there also are harmful bacteria that can be detrimental to health and wellbeing under poor hygiene conditions. In summary, the findings identify the importance of the proper handling of cow milk and cow dung as it relates to food safety, and demonstrate the important roles these microorganisms have in agriculture, nutrient cycling, and the production of Bio fertilizer.

Keywords: Bacterial Composition, Cow Milk and Dung, Feeding System, Microbial Diversity, Beneficial and Harmful Bacteria, Hygiene and Agriculture.

How to Cite: Champa Tolia; Khushi Joshi; Amrapali Rai; Saloni Sharma; Aditi Thakur (2026) Bacteriological and Compositional Comparison of Milk and Dung from House-Fed and Farm-Fed Dairy Cows. *International Journal of Innovative Science and Research Technology*, 11(10), 385-398. <https://doi.org/10.38124/ijisrt/26oct308>

I. INTRODUCTION

Manure from cow, either dumped onto pasture and farmland, or dropped onto the ground, will release microbial contaminants in the form of fecal matter (such as *E. coli*) that can be moved into the water supply by water carrying sediment from land or by soil washing toward wells. The current knowledge about the persistence and movement of water-extractable microbes from exposed manures in the field is limited. The majority of the studies conducted to determine the fate and transport of pathogenic fecal organisms is performed on the basis of indicators, which are further often compared with those determined from pathogenic Organism [1]. The application of cow manure can improve the mineral composition of soil, help plants resist insect infestations and diseases, and improve plant growth, and many other beneficial functions such as sulphate oxidation and

phosphorus solubilization. Consequently, cow manure is predominantly composed of 80% water and contains non-digested plant material with a high concentration of nutrient and microorganisms and their by products. The microorganism community of cow manure contains a large number of bacilli, lactobacilli, and cocci, as well as numerous unidentified fungi and yeast type [2]. Cow dung used for these purposes is a financially feasible and ecologically sound/bio-friendly product and are organic fertilisers, composts, and bio-manures (have low chemical content) that will help to reduce the use of chemical fertilisers and the potential negative impacts to the environment. Cow dung can also provide renewable energy in the production of biogas. On the other hand, cow milk represents a highly nutritious food that is a great source of protein, fat, vitamins, and minerals that support growth and development in humans and are particularly important for children's developing

skeletons/type bone structure, primarily due to its high levels of calcium and phosphorus, and also has immunological benefits because of the presence of bioactive peptides and antibodies. Cow milk and all cow milk products are extremely important to the world economy and rural communities' economic well-being, generating billions of dollars every year within the global dairy industry. Cow dung and cow milk are vital components of livestock Agri-ecosystems and interrelated to both traditional and contemporary science and will be critical for making progress with achieving sustainable development and food security. The dairy cow is the most commonly studied animal. Previous studies indicate that humans have some knowledge about ruminants, based on the studies of their digestive process. Ruminants are classified as herbivores and utilize foregut fermentation to digest cellulose found in plant material [3]. At some point in time throughout evolution, all vertebrates lost their ability to produce the enzymes needed to break down cellulose and many other complex carbohydrates. Ruminants have a natural symbiotic relationship with microorganisms, and they rely upon their gut microflora to digest plant material that contains many of these compounds. The microflora produces enzymes to break the complex carbohydrates down into simpler compounds that can be easily absorbed by the intestines. For the microflora to be able to perform this function, there must be an optimal environment and food source for them to survive. Therefore, there is a mutualistic relationship between ruminants and their gut microflora, where the ruminant is the host and provides food and an environment for the gut microflora, and in return, the gut microflora provides essential nutrients for the ruminant. There are a vast number of various types and species of microorganisms that inhabit the digestive system of ruminant fibrous feeds, with the primary function of digesting nutrients, primarily fibrous feed materials containing cellulose and hemicelluloses. Approximately 95% of the rumen (an anaerobic digestion compartment of ruminants) is made up of bacteria, archaea, fungi, and protozoa, with the end products of digestion being volatile fatty acids (VFAs) (primarily propionic acid and butyric acid), that provide most of the energy for the animal's body and that impact body functions, such as production rates [4]. Rumen microbes play an important role in the creation and support of life due to their ability to aid in the degradation and use of hard-to-digest fiber, thereby providing livestock with 60-85% of the amino acids which enter the small intestine; and about 70% of the energy needed by the animal [5].

II. MATERIAL AND METHOD

The samples are differentiated in the two forms- house feeding cow and farm feeding cow.

- House feeding cow (stall feeding) means providing all food and water to the cow inside a shed its common in dairy.
- Farm feeding cow means grazing cows eat grass directly from the field instead of being fed in a shed. It is the most natural and low-cost feeding method.

Cow dung and milk sample were collected from local dairy. The cow dung sample was collected using hand gloves, spatula and sterile polythene bag whereas cow milk was collected by the use of hand gloves and sterile bottle

We will divide the sample into the two form – house feeding and farm feeding milk other one is house feeding and farm feeding cow dung.

➤ Method/ Isolation of Milk (House and Farm Feeding Cow)

The cow milk taken to the lab kept in aseptic condition. Media was prepared by adding distilled water and nutrient agar (Beef, Peptone, NaCl, Agar). Then autoclave the media at 121 Temperature and 15 psi. when media is prepared pour onto the sterilized petri plates under aseptic condition (under laminar air flow). Before using laminar wipe, it with ethanol and allow UV for 15 minutes. After all this procedure serial dilute the sample. Serial dilution done in in 10^1 , 10^3 , 10^5 Dilution. Then with the help of pipette pour 100ul/l onto the agar and with the help of spreader spread it completely. Incubate the plates at 35°C for 1-2 days. After 1-2 days see the colonies and streak then onto the nutrient agar using wire inoculating loop under laminar air flow and again incubate the plate for 1-2 days mark the plates with the name A, B, C and the no. of isolate use further for different tests.

• Test 1. Gram Staining

Gram staining is a standard laboratory technique used for the identification and classification of bacteria. Bacteria are divided into two groups

- ✓ Gram positive bacteria- have a thick peptidoglycan layer and retain the crystal violet stain, appearing purple.
- ✓ Gram negative bacteria- have a thin peptidoglycan layer and lose the crystal violet during decolorization, taking up safranin and appearing pink.

• Test 2. Catalase Test

The catalase test is a simple biochemical test used to detect the presence of the enzyme catalase in bacteria with the help of hydrogen peroxide. The enzyme catalase breaks down hydrogen peroxide (H_2O_2). The release of oxygen gas produce visible bubbles. The test is easy to perform; bacterial cells are simply mixed with H_2O_2 to determine the presence of catalase.

➤ Qualitative Test for Milk

• Test 1. Methyl Blue Test

Methylene blue is a blue dye that gets decolorized when bacteria consume oxygen. We will use to assess the quality of milk based on bacterial activity. We have to use 10ml fresh milk sample and add 1 ml methylene blue solution then we will do water bath in 37°C observe the time taken for the blue color to disappear. More bacteria – faster oxygen consumption- faster loss of blue color.

• Test 2. Phenolphthalein Solution Test

Phenolphthalein is a chemical indicator used to detect whether a solution is acidic or basic (alkaline). We will use

phenolphthalein solution 2-3 drops in 5ml milk sample + 5ml ethanol than we will add NaOH dropwise pink color appear. It means this sample show the alkaline nature.

- *Test 3. Biuret Test*

This is a chemical test to detect the presence of protein in a sample. Take 5ml of milk sample in a clean test tube after then add 2 ml of biuret reagent to the sample mix gently by shaking. Let the mixture stand for 1-2 minutes next, we will observe the color if color will be violet / purple color – protein present and if light blue color obtained its means protein absent.

- *Test 4. Vitamin Quantification (Determination of Vitamin B in the House Feeding Cow Milk and Farm Feeding Cow Milk) UV- Spectroscopy*

Vitamin quantification in milk means measuring the amount of vitamin present. This is important for several scientific, nutritional reasons. Milk is a major source of essential vitamin, measuring them helps confirm that milk provides adequate, especially for children, pregnant women, elderly people.

- *Test 5. Casein Extraction Method*

This is the most widespread technique employed for the extraction of Casein. In this technique, milk was treated with an acid like hydrochloric acid, sulfuric acid, or acetic acid to lower the pH of milk which leads to a formation of precipitate characteristic of curd. The curd was then removed by filtration, and a neutralizer was added to neutralize the acid in the milk.

- ✓ The initial step is to take samples of milk to put into beakers of 250ml, and heat milk samples to 35 degrees Celsius.
- ✓ Next, we pour Hydrochloric acid in it while stirring it simultaneously in both the beaker containing milk samples, 10% of HCl for 100% Milk As a result, the milk will decrease in pH and casein will coagulate
- ✓ Once you have the milk coagulated, pass it through the filter paper to separate casein and whey. (Curd is the portion of the milk which contains casein).
- ✓ The separated curd will remain in the filter paper, wash it to get rid of the acid and whey proteins.
- ✓ Dry the casein to remove the water from it. After drying a precipitate form of casein will be left over.
- ✓ Take the weight of precipitated casein.

➤ *Method / Isolation of Dung (House Feeding and Farm Feeding Cow)*

There are two different sample of cow dung were collected from different area like (house feeding and farm feeding) of Dehradun district, aseptically in sterile poly bags and transported to microbiology laboratory of the department of Rapture biotech for the evaluation of microbial analysis.

- *Serial Dilution-*

The cow dung was prepared by taking a piece of cow dung (1 gm) and mixing this into 10ml of sterile phosphate buffer and then placed in the vortex mixer at high speed for 2 minutes to thoroughly mix everything together. Before

injecting onto the agar plates, the suspensions were placed in incubators set to 37 degrees Celsius for 30-40 minutes to activate the microorganisms. The dilutions for each of the samples were then prepared using the standard dilution technique with the use of a sterile micropipette.

Purification of different bacterial strains used nutrient agar as a growth medium. This involved placing a sterile inoculating loop slightly into a distinguishable bacterial colony (via a spread plate), and then streaking this over the surface of a new plate in a zigzag fashion. The inoculating loop (with the original colony attached) was sterilized with a flame, the plated turned 90 degrees and the zigzag technique repeated. The loop was once more sterilized with flame and the process continued until all plates had been incubated for 24 hours. There was evidence of many colonies in the first quadrant of the plate (colonies with heavy growth), and isolated colonies were found in the third quadrant of the plate. This process was repeated until pure colonies of bacteria were obtained, and the pure cultures were preserved in slant form on nutrient agar.

- ✓ *Test 1. Gram Staining*

Gram staining is a standard laboratory technique used for the identification and classification of bacteria. Bacteria are divided into two groups. Gram positive bacteria- have a thick peptidoglycan layer and retain the crystal violet stain, appearing purple. Gram negative bacteria- have a thin peptidoglycan layer and lose the crystal violet during decolorization, taking up safranin and appearing pink.

- ✓ *Test 2. Catalase Test*

The catalase test is a simple biochemical test used to detect the presence of the enzyme catalase in bacteria with the help of hydrogen peroxide. The enzyme catalase breaks down hydrogen peroxide (H₂O₂). The release of oxygen gas produces visible bubbles.

- ✓ *Test 3. Urease Test*

Urease is a biochemical assay employed to detect and identify environmental organisms that synthesise the urease enzyme. The urease enzyme catalyses the breakdown of urea into ammonia and carbon dioxide. Consequently, during the urease test, an increase in the pH value occurs as a result of ammonia production in the growth medium. This modification of pH is recognized via the phenol red pH indicator by its change from yellow/orange to pink in the test's positive result. The assay procedure requires the inoculation of a urea-agar or broth growth medium followed by an incubation period of between 35-37°C for 18-24 hours. A color change to pink will show a positive result and there will be no color change for a negative result.

- ✓ *Test 4. Citrate Test*

A urease test is a biochemical assay to determine the presence of the enzyme urease in an organism. The enzyme urease hydrolyzes urea into ammonium ions and carbon dioxide and increases the pH of the solution. The change in pH is detected by phenol red, which changes color from yellow/orange (in an acidic solution) to pink (in a basic solution). The urease test is performed by inoculating either

urea agar or broth with an organism and incubating at 35–37°C for 18–24 hours. If a pink color develops from your inoculum, then your result is positive; if no color develops, then your result is negative.

✓ *Test 5. Nitrate Reductase Test*

The nitrate test used to determine whether bacteria can reduce nitrate (NO_3^-) to nitrite (NO_2^-) or nitrogen gas during anaerobic respiration. The test performed by nitrate broth with the organism and incubating at 35–37°C for 24hr often with a test tube to detect gas production. After incubation, reagents A (sulphanilic acid) and B (α -naphthylamine) are added. A color change indicates nitrite production, while gas formation in the test tube indicates nitrogen gas production.

✓ *Test 6. H_2S Test (Hydrogen Sulfide)*

The H_2S test is used to detect the ability of bacteria to produce hydrogen sulfide gas. This gas reacts with ferric ions in the medium to form black precipitate. Incubated at 35–37°C for 24 hours. A black color indicates a positive result, while no color change indicates a negative result.

✓ *Test 7. Indole Test*

The indole test is a biochemical test used to determine whether bacteria can produce indole from tryptophan using the enzyme tryptophanase. Indole reacts with kovac's reagent to form a red color. The test is performed by inoculating tryptone broth and incubating at 35–37°C 24 hours. After incubation, kovac's reagent is added. Positive result red layer forms and negative result no red color forms.

✓ *Test 8. MR (Methyl Red) Test*

The MR test is used to detect bacteria that produce stable acids from glucose fermentation, lowering the pH below 4.4 methyl red indicator is used to show the result. After incubating MR broth at 35–37°C for 24 hours, methyl red is added. Positive result shows red color and negative shows yellow color.

✓ *Test 9. MR-VP Test*

The MR-VP test consists of two tests MR (detect acid production) and VP (detects acetoin, a neutral end product of glucose fermentation). The VP test is performed by adding α -naphthol and KOH to the incubated broth and observing the color after 15–30min. positive result shows red/pink color and negative result no color change.

✓ *Test 10. Carbohydrate Test*

A carbohydrate fermentation test is used for the identification of bacteria through their ability to ferment certain carbohydrates and produce acid/gas. Bacteria ferment carbohydrate sources (e.g. glucose, lactose, sucrose, dextrose or mannitol) producing acid (which decreases the pH), and sometimes gas (i.e. carbon dioxide or hydrogen, which is collected in a Durham tube). A phenol red indicator is used in the test, if no fermentation occurred the broth will remain red (indicates neutral pH). If acid is produced during the fermentation of carbohydrate, the broth will be yellow (positive result).

✓ *Test 11. Protease Test*

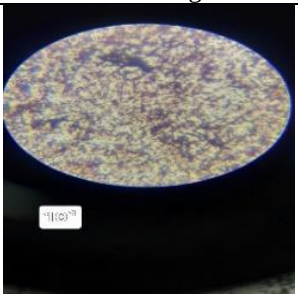
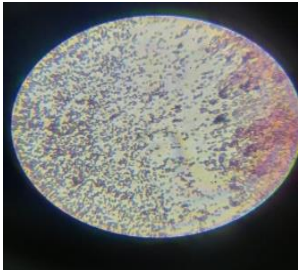
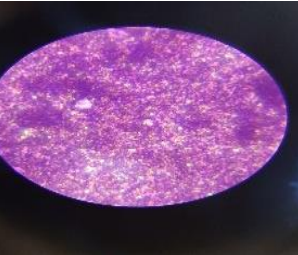
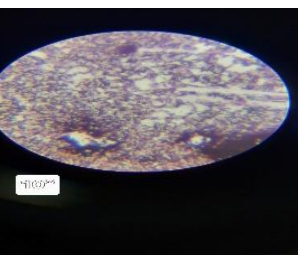
The protease test is used to identify bacteria that produce proteolytic enzyme capable of breaking down protein into peptides and acids. It commonly involves the hydrolysis of protein like casein and gelatin. Media such as skim milk agar. The test organism is inoculated and incubated at 35–37°C for 24–48 hours. A clear zone around bacterial growth indicates protein hydrolysis (positive result), while absence of a clear zone indicates a negative result.

III. RESULT

➤ Cow Milk (House Feeding and Farm Feeding)

• Gram Staining

Table 1 Gram Staining

Farm Feeding Cow Milk			House Feeding Milk		
					
					
					

• Quantification Test

✓ House Feeding Cow Milk

Table 2 House Feeding Cow Milk Test

S.NO.	TEST	RAW MILK	PASTEURIZED MILK
1.	Methylene blue test	- -	++
2.	Phenolphthalein solution test	++	++
3.	Biuret test	++	-+

✓ Farm Feeding Cow Milk

Table 3 Farm Feeding Cow Milk

S.NO.	TEST	RAW MILK	PASTEURIZED MILK
1.	Methylene blue test	- -	++
2.	Phenolphthalein solution test	+-	+-
3.	Biuret test	++	+ -

• Vitamin Quantification Test - (House Feeding Cow Milk and Farm Feeding Cow Milk)

✓ Vitamin Quantification- UV Spectroscopy

Table 4 Vitamin Quantification- UV Spectroscopy

s.no	dH ₂ O	QC	5%NaNO ₂	Incubation for 5 min (dark)	10% AlCl ₃	Incubation for 10 min (dark)	1M NaOH
Blank	7.4	-	30		300		2ml
T1	7.2	20					
T2	7.0	40					
T3	6.8	60					
T4	6.6	80					
T5	6.4	100					
Sample (Raw milk)	6.5	500					
Sample (Pasteurized milk)	6.5	500					

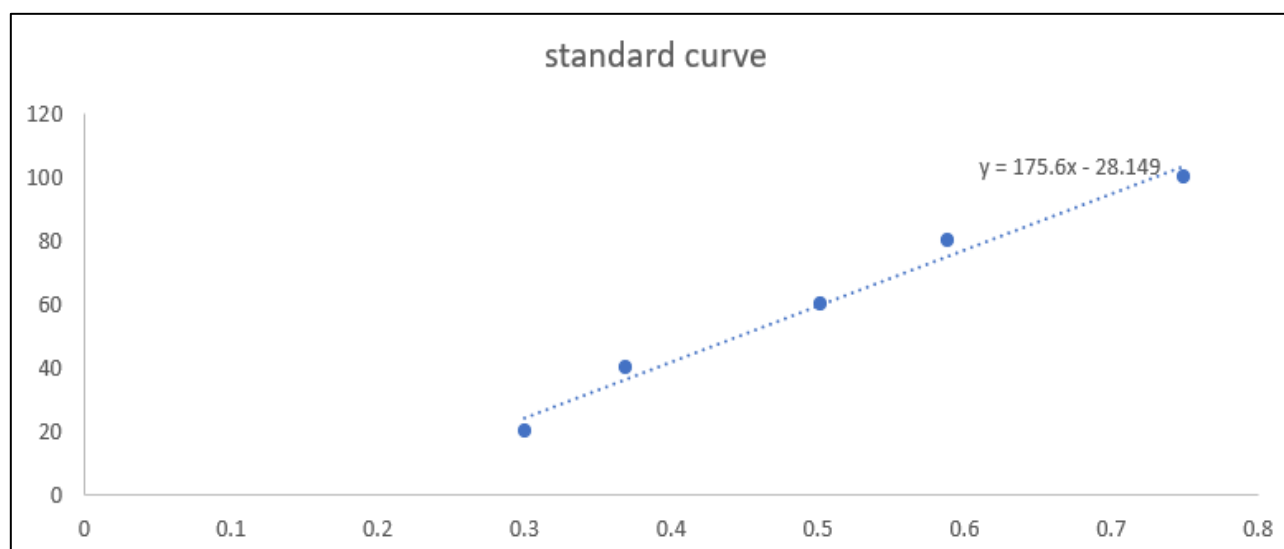


Fig 1 House Feeding Cow Milk

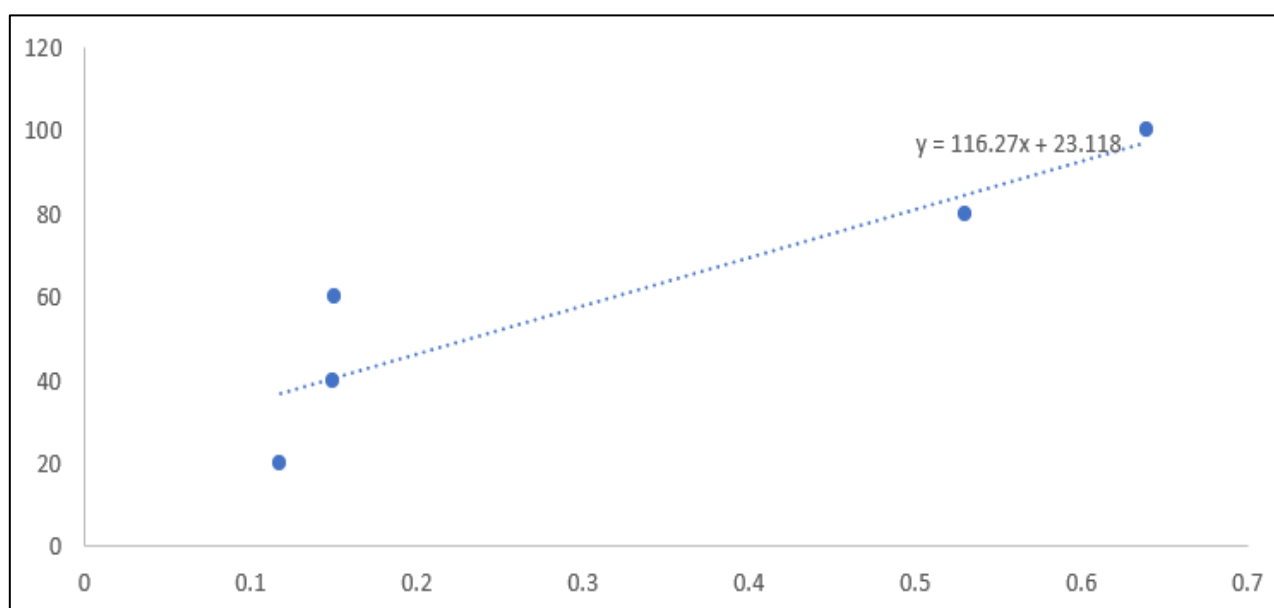


Fig 2 Farm Feeding Cow Milk

- Casein Extraction Result
- ✓ House Feeding Cow Milk



Fig 3 Before Dry- 20.51g



Fig 4 After Dry- 5.25g

- ✓ Farm Feeding Cow Milk



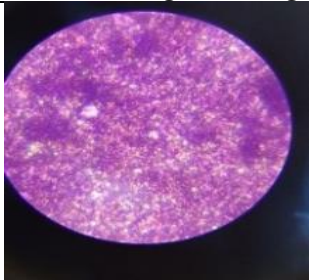
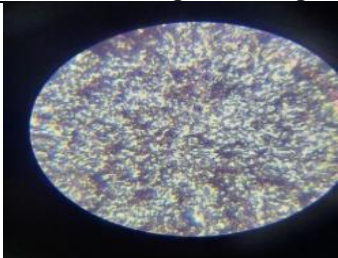
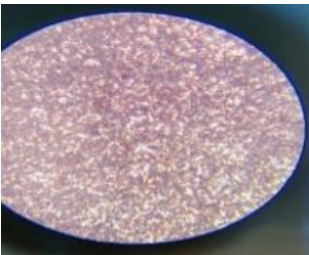
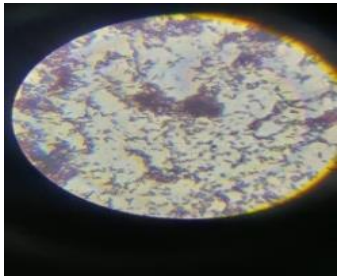
Fig 5 Before Dry-30.00g

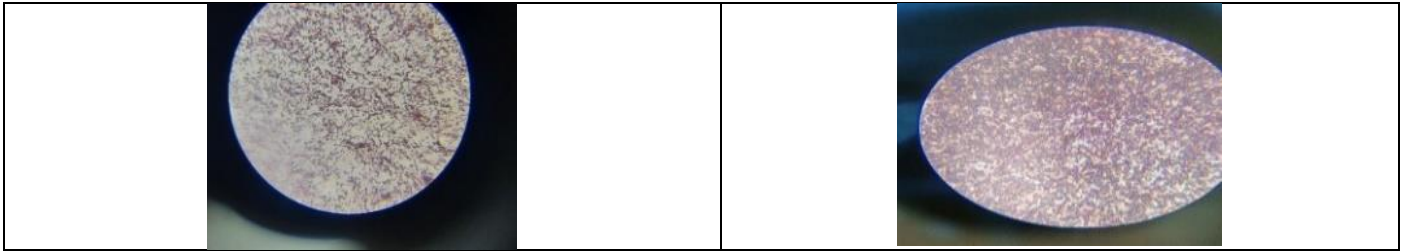


Fig 6 After Dry- 14.00g

- Cow Dung (House Feeding and Farm Feeding)
- Gram Staining

Table 5 Gram Staining

House Feeding Cow Dung		Farm Feeding Cow Dung	
			
			



- Catalase Test**

Table 6 Catalase Test

House Feeding Cow Dung	Farm Feeding Cow Dung
Bacteria A- positive Bacteria B- positive Bacteria C- negative	Bacteria A- positive Bacteria B- positive Bacteria C -positive

- Biochemical Test Result**

- ✓ **House Feeding Cow Dung**

Table 7 House Feeding Cow Dung

S.NO.	TEST	BACTERIA A	BACTERIA B	BACTERIA C
1.	Urease test	++	++	++
2.	Citrate test	--+	++	++
3.	Nitrate test	++	++	++
4.	H ₂ S	++	+--	++
5.	Amylase test	---	++	++
6.	Indole test	++	++	++
7.	MR test	++	++	---
8.	MR-VP test	---	---	---
9.	Carbohydrate test	Sucrose ++ D mannitol --- Lactose --- Dextrose ++ Maltose---	Sucrose +- D mannitol --- Lactose ++ Dextrose ++ Maltose ++	Sucrose --- D mannitol - Lactose ++ Dextrose ++ Maltose ---
10.	Protease test	+-	++	+--

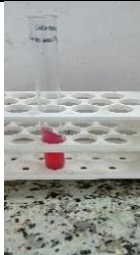
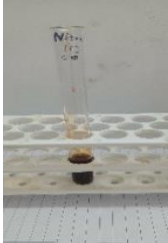
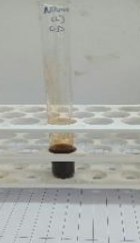
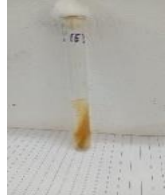
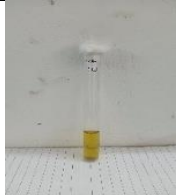
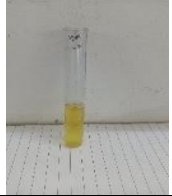
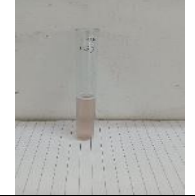
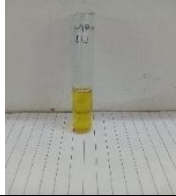
++(positive), +- (partially positive), --- (negative)

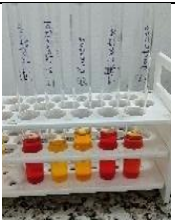
Table 8 House Feeding Cow Dung Result

S.NO.	TEST	BACTERIA A	BACTERIA B	BACTERIA C
1.	Urease test	++	++	++
2.	Citrate test	++	++	++
3.	Nitrate test	+-	+-	+-
4.	H ₂ S	+-	+-	+-
5.	Amylase test	++	++	++
6.	Indole test	++	++	++
7.	MR test	---	---	---
8.	MR-VP test	++	++	++
9.	Carbohydrate test	Sucrose ++ D mannitol ++ Lactose ++ Maltose ++ Dextrose +-	Sucrose- - D mannitol - - Lactose - - Maltose - - Dextrose - -	Sucrose ++ D mannitol ++ Lactose - - Maltose +- Dextrose ++
10.	Protease test	--	+-	++

++(positive), +- (partially positive), --- (negative)

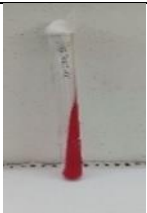
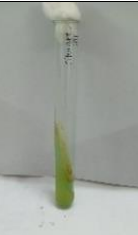
Table 9 Farm Feeding Cow Dung Result

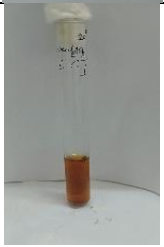
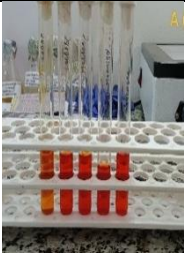
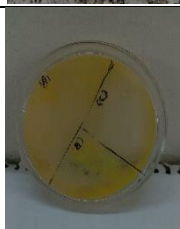
S.no.	Test	Bacteria a	Bacteria b	Bacteria c
1.	Urease test			
2.	Citrate test			
3.	Nitrate test			
4.	H ₂ S test			
5.	Amylase test			
6.	Indole test			
7.	MR test			
8.	MR-VP test			

9.	Carbohydrate test			
10.	Casein test			

✓ Farm Feeding Cow Dung

Table 10 Farm feeding cow dung

s.no	Test	Bacteria A	Bacteria B	Bacteria C
1.	Urease test			
2.	Citrate test			
3.	Nitrate test			
4.	H ₂ S			
5.	Amylase test			

6.	Indole test			
7.	MR test			
8.	MR-VP test			
9.	Carbohydrate test			
10.	Casein test			

IV. DISCUSSION

➤ House Feeding Cow Milk Bacteria

The present study demonstrated the presence of diverse bacterial population in cow milk sample including Streptococcus, bacillus spp. and Lactobacillus. The occurrence of these bacteria indicates that raw milk serves as a rich medium for microbial growth, influenced by environmental, hygienic, and handling conditions.

➤ Farm Feeding Cow Milk Bacteria

Milk from grazing cows contain diverse bacterial populations due to environmental exposure. The presence of bacteria such as staphylococcus, Escherichia coli and Lactobacillus. There are some beneficial microflorae and some harmful microflora. Staphylococcus and Escherichia coli indicates contamination from fecal matter, soil and lactobacillus represent beneficial microflora and also there are less controlled hygiene compared to indoor system.

➤ House Feeding Cow Dung Bacteria

The present study investigated the bacterial composition of dung from house feeding cows and identified the presence of Staphylococcus, Enterobacter and Lactobacillus.

• Staphylococcus And Enterobacter

The occurrence of Staphylococcus and Enterobacter in cow dung may be attributed to contamination from surrounding environment and fecal origin.

• Lactobacillus

Lactobacillus species are considered beneficial microorganism commonly found in the gastrointestinal tract of animals. These bacteria play an important role in maintaining gut health and may contribute to nutrient breakdown and microbial balance within the digestive system.

➤ Farm Feeding Cow Dung Bacteria

The present study identified the presence of *Proteus vulgaris*, *Klebsiella oxytoca* and *Bacillus subtilis* in cow dung samples, a diverse microbial population influenced by the gastrointestinal tract and environmental exposure. These bacteria represent both intestinal microflora and soil associated organism, reflecting the complex ecology of cow dung.

• *Proteus Vulgaris*

Gram negative, rod-shaped bacterium commonly found in the intestinal tract of animals and humans and it appears in cow dung due to its fecal origin. In cow dung *Proteus vulgaris* plays an important role in the decomposition of organic matter, particularly protein.

• *Klebsiella Oxytoca*

Gram negative, rod-shaped bacterium that is widely distributed in soil, water, plant surfaces and the intestinal tract of animal. In cow dung, *Klebsiella oxytoca* contributed to nutrient cycling and plays a role in maintaining soil fertility, as some strains are capable of nitrogen fixation. Despite its environmental importance, it can act as an opportunistic pathogen and is associated with infection such as pneumonia and septicemia, particularly in immunocompromised individuals.

• *Bacillus Subtilis*

Gram-positive, rod-shaped bacterium commonly found in soil, water, air and cow dung. In cow dung *Bacillus subtilis* plays a crucial role in the decomposition of organic matter and also produces antimicrobial substances that help suppress harmful microorganism.

V. CONCLUSION

This research shows the different types of microbes found in cow's milk and cow dung collected from either a home or a farm system. Both types of samples had bacteria types, both good and bad. Sampled bacteria included *Streptococcus*, *Staphylococcus*, *Escherichia coli* (*E. coli*), *Lactobacillus*, and *Bacillus* species all of which show how milk could be an abundant source of food for microbes to live on. Examples of bad microbes such as *Staphylococcus* and *E. coli* mean these samples probably resulted from cross-contamination where no proper hygiene measures were taken while handling the products or an unsafe environment. Examples of good microbes, like *Lactobacillus*, are important because they add to the nutrition of food and can also help support gut health. Cow dung comprises a large diversity of organisms, many of which are the result of interaction between cow's gut microbiota and environmental exposure. Cow manure from home feedlots contains a variety of bacterial species such as *Staphylococcus*, *Enterobacter*, and *Lactobacillus*, whereas farm-fed cow manure has species such as *Proteus vulgaris*, *Klebsiella oxytoca*, and *Bacillus subtilis*. In the decomposition of organic materials; in nutrient cycling; and in enhancing soil fertility, these microorganisms play a crucial role. *Bacillus subtilis* is happy to help with

organic matter decomposition and has antimicrobial properties. *Klebsiella oxytoca* may help fix nitrogen. On the other hand, opportunistic pathogens such as *Proteus vulgaris* and *Klebsiella oxytoca* could be detrimental to human health. Based on these findings, it is evident that cow and cow's milk can contain harmful and beneficial microorganisms, which can play vital roles in agricultural applications, soil health, and sustainable practices such as biogas production and biofertilization. Given that poor hygiene or improper handling of these materials can pose a threat to human health, knowing the microbial composition of cow dung and milk will improve food safety and support agriculture and environmental biotechnological applications.

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