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ASSESSMENT OF MICROBIAL EVALUATION OF PACKAGED DRINKING WATER OF SIDDIPET DISTRICT OF TELANGANA STATE

Linga Bhavananda* and Dr.Madan MohanGunda

Department of Microbiology , Government Degree and P. G. College, Siddipet, Telangana, India

ABSTRACT

Safe drinking water is essential for maintaining human health and preventing waterborne diseases. Packaged drinking water is widely consumed due to its convenience and perceived safety. However, microbiological contamination may occur during processing, packaging, storage, or transportation. The present study was conducted to assess the microbial quality of packaged drinking water available in Siddipet, Telangana, India, using Total Viable Count (TVC) analysis. Four commercially available packaged drinking water brands, namely Kinley, Tata, Royal Challenge, and Flow, were collected from local markets on 25 March 2026 and analyzed on the same day. Serial dilution and spread plate techniques were employed for the enumeration of viable bacterial populations. Nutrient agar medium was used for cultivation, and inoculated plates were incubated at 37°C for 24–48 hours. Colony counts obtained from different dilution levels were recorded and compared. All samples exhibited bacterial growth, although the observed counts were relatively low. Flow water showed the highest colony count, while Tata water exhibited the lowest count. The findings suggest the presence of viable microorganisms in all tested samples and emphasize the importance of regular microbiological monitoring of packaged drinking water to ensure consumer safety and maintain product quality.

KEYWORDS

Packaged drinking water, Total Viable Count, Microbial quality, Serial dilution, Spread plate method, Water quality assessment.

INTRODUCTION

Water is essential for life and plays a crucial role in maintaining public health. The increasing demand for safe drinking water has led to the widespread consumption of packaged drinking water. These products undergo various purification processes such as filtration, reverse osmosis, ultraviolet treatment, and ozonation to improve their quality.

Despite these treatment methods, microbial contamination may occur during production, packaging, transportation, or storage. Therefore, routine microbiological monitoring is necessary to ensure the safety of packaged drinking water.

Total Viable Count (TVC) is a commonly used microbiological parameter for assessing the overall bacterial population present in water. It serves as an important indicator of microbiological quality and sanitation.

The contributions of Louis Pasteur and Robert Koch laid the foundation for modern microbiology and microbial detection techniques, while Sergei Winogradsky and MartinusBeijerinck advanced the understanding of microbial ecology. Their work continues to support modern water quality assessment practices.

The present study was undertaken to evaluate the microbial quality of four commercially available packaged drinking water brands collected from Siddipet using serial dilution and spread plate techniques.

OBJECTIVES

The objectives of the present study were:

1. To assess the microbiological quality of packaged drinking water samples.
2. To determine the Total Viable Count of selected commercial brands.
3. To compare bacterial populations among different packaged drinking water brands.
4. To evaluate the microbiological status of packaged drinking water available to consumers.

METHODOLOGY

Study area

The study was conducted in the Department of Microbiology, Government Degree &PG CollegeSiddipet. Packaged drinking water samples were collected from retail outlets located in Siddipet, Telangana, India.

Sample collection

Four commercially available packaged drinking water brands were selected for the study. The brands included Kinley, Tata, Royal Challenge, and Flow. All samples were purchased from local markets on 25 March 2026. Each bottle had a volume of one litre. Samples were transported carefully to the laboratory and analyzed on the same day to minimize any changes in microbial quality.

Figure 1: Water Sample Collection

Preparation of nutrient agar

Nutrient agar medium was prepared by dissolving 7 g of nutrient agar powder in 240 mL of distilled water. The medium was heated until complete dissolution and sterilized in an autoclave at 121°C and 15 psi pressure for 15 minutes. After sterilization, the medium was cooled and poured aseptically into sterile Petri plates inside a laminar air flow chamber. The plates were allowed to solidify before use.

Serial dilution

Three sterile test tubes containing 9 mL of sterile distilled water were prepared and labeled as 10^{-1}, 10^{-2}, and 10^{-3}. One millilitre of the water sample was aseptically transferred into the tube labeled 10^{-1} and mixed thoroughly. Subsequently, 1 mL from the 10^{-1} dilution was transferred to the 10^{-2} dilution tube and mixed. Similarly, 1 mL from the 10^{-2} dilution was transferred into the 10^{-3} dilution tube. The same procedure was repeated for all packaged drinking water samples.

Spread plate technique

A volume of 0.1 mL from each dilution was inoculated onto separate nutrient agar plates. The inoculum was spread evenly over the agar surface using a sterile L-shaped spreader. All plating procedures were performed aseptically within a laminar air flow chamber to avoid external contamination.

Incubation

The inoculated plates were incubated at 37°C for a period of 24–48 hours. After incubation, visible bacterial colonies that developed on the agar surface were observed and counted.

Colony enumeration

The number of colonies appearing on each plate was recorded manually. Colony counts obtained from different dilutions were used to evaluate the microbial quality of the packaged drinking water samples.

The microbial load was estimated using the following formula:

CFU/mL = Number of Colonies × Dilution Factor ÷ Volume Plated

RESULTS

Microbiological analysis of the packaged drinking water samples revealed the presence of viable bacterial colonies in all four brands tested. Colony counts decreased with increasing dilution levels, indicating the effectiveness of the serial dilution procedure.

Table 1. Colony Counts Observed at Different Dilution Levels

Brand	10^{-1} Dilution	10^{-2} Dilution	10^{-3} Dilution
Kinley	5	2	1
Tata	4	1	0
Royal Challenge	5	2	1
Flow	8	3	2

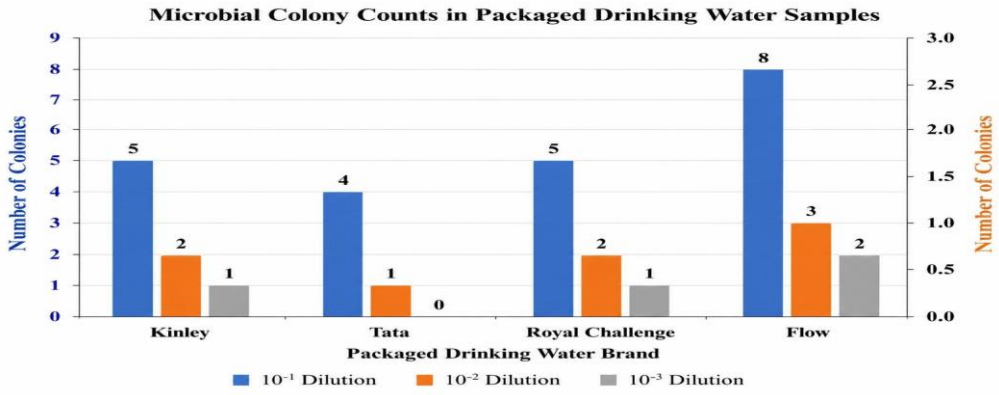

Figure 2 - Microbial colony counts of packaged drinking water samples at different dilution levels

Flow exhibited the highest colony count among the tested samples, while Tata showed the lowest count. Kinley and Royal Challenge displayed similar colony counts at all dilution levels.

Table 2 –Summary table

Parameter	**Value**
Number of samples	4
Total colonies observed	34
Mean colony count per brand	8.5
Highest count	13(flow)
Lowest colony	5(Tata)
Range	8

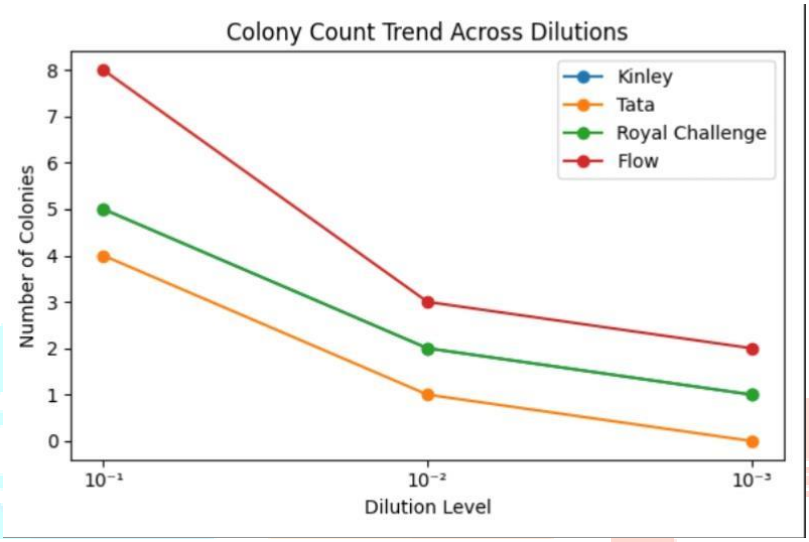

Figure 3 –Microbial colony counts of packaged drinking water samples at different dilution levels.

Figure 3 – Colony Growth on Nutrient Agar Plates

Colony morphology

The bacterial colonies observed on nutrient agar plates were predominantly white to cream in colour. Most colonies appeared circular in shape with smooth surfaces and regular margins. No distinct pigmentation or unusual colony characteristics were observed during the study.

DISCUSSION

The present study revealed the presence of viable bacterial colonies in all packaged drinking water samples analyzed. Among the tested brands, Flow exhibited the highest colony count, while Tata showed the lowest microbial count. Kinley and Royal Challenge demonstrated similar levels of bacterial growth.

The decrease in colony numbers with increasing dilution confirmed the effectiveness of the serial dilution technique. The colonies observed were predominantly white to cream in colour, circular in shape, and smooth in appearance.

The detection of viable microorganisms in packaged drinking water suggests that low levels of bacterial contamination may persist despite purification processes. Similar observations have been reported in studies of drinking water quality. According to the principles established by Louis Pasteur and Robert Koch, microorganisms can be detected and studied using culture-based methods such as the spread plate technique employed in the present investigation.

Although the microbial counts observed were relatively low, continuous microbiological monitoring and strict hygienic practices during production, packaging, transportation, and storage remain essential to ensure consumer safety and maintain water quality standards.

LIMITATIONS OF THE STUDY

The present study was limited to four packaged drinking water brands collected from a single geographical location. Only Total Viable Count analysis was performed to evaluate microbiological quality. The study did not include the detection of coliform bacteria, fecal indicators, fungal contamination, or identification of bacterial isolates. Physicochemical parameters such as pH, total dissolved solids, conductivity, and hardness were also not investigated. Future studies involving larger sample sizes, multiple locations, seasonal variations, and advanced microbial identification techniques would provide a more comprehensive assessment of packaged drinking water quality.

CONCLUSION

The present study successfully evaluated the microbial quality of four packaged drinking water brands available in Siddipet using serial dilution and spread plate techniques. Viable bacterial colonies were observed in all samples analyzed. Flow water exhibited the highest bacterial count, while Tata water showed the lowest count. Kinley and Royal Challenge demonstrated intermediate levels of bacterial growth.

The study confirms that packaged drinking water may contain low levels of viable microorganisms despite undergoing purification processes. Therefore, regular microbiological monitoring, effective sanitation practices, proper storage conditions, and strict quality control measures are essential for ensuring the safety and quality of packaged drinking water supplied to consumers.

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CONFLICTS OF INTREST

The Authors Declare No Conflict Of Interest.

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