

Microbiological Characterization of Bacterial Isolates from Used Floor Mop Water and Used Table Wiping Water

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ABSTRACT

Domestic environments can serve as reservoirs and transmission sites for bacteria through household cleaning activities. This study aimed to characterize bacterial isolates obtained from used floor mop water and used table wiping cloth water as two domestic cleaning media. A laboratory experimental design with a descriptive approach was applied to one sample from each source. The isolates were characterized based on colony growth, cell morphology, Gram staining, Ziehl-Neelsen staining, and citrate utilization. A total of 82 colonies were observed from the used floor mop water cultured on Nutrient Agar, whereas 298 colonies were observed from the used table wiping cloth water cultured on Potato Dextrose Agar. Both isolates exhibited coccoid cell morphology, a Gram-negative reaction, a non-acid-fast reaction, and negative citrate utilization. This study provides preliminary phenotypic characterization of bacterial isolates recovered from used floor mop water and used table wiping cloth water, two domestic cleaning water sources that have received limited attention in household environmental microbiology. Further characterization using additional biochemical assays and molecular approaches, such as 16S rRNA analysis, is required for more accurate bacterial identification.

INTRODUCTION

Microorganisms are widely distributed in environments that interact with human activities, including household surfaces and water used for cleaning. Their occurrence is influenced by environmental conditions, sanitation practices, and the accumulation or transfer of microorganisms during daily activities. Rahmatullah et al. (2021) reported bacterial growth on all Nutrient Agar (NA) plates exposed in a blood component room, with Gram-positive cocci predominating among the isolates. Similarly, Rahmah et al. (2023) found bacterial growth on all NA media placed in a microbiology laboratory. Wahyuni et al. (2024) described NA as a general-purpose medium that supports the growth of various bacteria (Rahmatullah et al., 2021; Rahmah et al., 2023; Wahyuni et al., 2024). These findings indicate that bacteria can persist in environments associated with human



activities when suitable conditions for growth are available. This context makes microbiological characterization relevant for examining bacterial isolates recovered from domestic cleaning environments.

Domestic cleaning activities involve repeated contact between cleaning materials, household surfaces, water, and human activities, creating opportunities for bacterial transfer and accumulation. Pettalolo et al. (2025) reported that bacteria remained detectable on the palms of individuals after handwashing, although bacterial counts decreased following cleaning. Nurrusyda et al. (2024) also detected *Escherichia coli* in drinking-water samples, while Khakim and Rini (2018) reported the presence of *E. coli* and *Salmonella sp.* in analyzed water samples (Pettalolo et al., 2025; Nurrusyda et al., 2024; Khakim and Rini, 2018). Although these studies examined different environmental sources, they demonstrate that water and surfaces associated with human activities can harbor bacteria. However, these studies focused on other environmental sources and did not specifically address the microbiological characteristics of bacterial isolates recovered from used floor mop water and used table wiping cloth water. The present study addresses this gap by providing a preliminary phenotypic characterization of bacterial isolates recovered from these two types of domestic cleaning water. These two types of cleaning water may contain microorganisms transferred from the surfaces and materials encountered during cleaning and therefore represent relevant samples for microbiological characterization.

Previous studies have characterized environmental bacteria using morphological, microscopic, staining, and biochemical approaches. Wulandhani et al. (2024) demonstrated the use of morphological observation and Gram staining to differentiate bacterial groups based on cellular characteristics, while Asih et al. (2023) applied Gram staining to characterize halophilic bacterial isolates according to their morphology and Gram reaction. Gergonius and Yuni (2016) further showed that biochemical testing, including citrate utilization, can complement morphological and staining observations by providing information on the physiological characteristics of bacterial isolates. Fusvita et al. (2025) also emphasized the importance of properly prepared bacterial smears for microscopic observation and subsequent identification procedures (Wulandhani et al., 2024; Asih et al., 2023; Gergonius and Yuni 2016; Fusvita et al., 2025). However, these studies focused on other environmental sources and did not specifically address the combined characterization of bacterial isolates obtained from used floor mop water and used table wiping cloth water. The present study addresses this gap by characterizing isolates from these two domestic cleaning-water sources through colony enumeration, cell morphology observation, Gram staining, acid-fast staining using the Ziehl-Neelsen method, and citrate utilization testing.

The combination of culture-based enumeration, microscopic observation, differential staining, and biochemical testing provides complementary information about bacterial isolates. A'yunin et al. (2025) demonstrated that the pour plate method can be used for bacterial enumeration, while Gram staining and citrate utilization provide information on cellular characteristics and metabolic properties, respectively (A'yunin et al., 2025). Applying these approaches to used floor mop water and used table wiping cloth water provides information on colony growth and basic microbiological characteristics under the respective culture conditions. Such information provides a preliminary microbiological profile of domestic cleaning water and may support better management

of cleaning materials and sanitation practices, particularly by highlighting that cleaning media themselves can retain bacterial contamination after use.

Therefore, this study aimed to characterize bacterial isolates obtained from used floor mop water and used table wiping cloth water based on colony abundance, cell morphology, Gram reaction, acid-fast characteristics, and citrate utilization. The study provides comparative baseline information on bacterial characteristics associated with two commonly used domestic cleaning media and contributes to the limited microbiological data concerning used cleaning water in household environments.

METHODS

1. Research Design and Sample Collection

This study employed a laboratory experimental design with a descriptive approach to characterize bacterial isolates obtained from used floor mop water and used table wiping cloth water. The study was conducted at the Biology Laboratory, Universitas Indraprasta PGRI, South Jakarta, Indonesia, from April to June 2026. The samples consisted of one used floor mop water sample collected from a residential environment and one used table wiping cloth water sample obtained from a glass table located outside the laboratory. The used table wiping cloth water sample was obtained by moistening a clean, dry tissue with water, wiping a stained glass table surface, and squeezing the tissue into a sterile plastic container. The used floor mop water was collected in a sterile plastic bottle after the mop had been used once to clean a floor in a residential room. Approximately 1 mL of each sample was transferred into sterile test tubes for serial dilution. The samples were transported directly to the laboratory on the same day without prior storage.

2. Media Preparation and Sterilization

All equipment and glassware were sterilized before use. Glassware was sterilized using an autoclave at 121°C for 20 min, while 70% alcohol was used as additional sanitation for equipment and the working environment. Nutrient Agar (NA) and Potato Dextrose Agar (PDA) were prepared from their constituent materials. PDA was prepared using 12 g of Potato Dextrose Broth (PDB), 10 g of bacteriological agar (Oxoid), and 500 mL of distilled water to obtain 500 mL of medium. NA was prepared using 6.5 g of Nutrient Broth (NB), 10 g of bacteriological agar (Oxoid), and 500 mL of distilled water to obtain 500 mL of medium. The prepared media were subsequently sterilized before use. A preliminary sterility test of the media preparation procedure and laboratory environment was conducted without sample inoculation. No contamination was observed during this preliminary test, and the subsequent isolation procedure was then performed.

3. Bacterial Isolation and Colony Enumeration

Bacterial isolation was performed using the pour plate method following ten-fold serial dilution. A volume of 1 mL of each sample was sequentially transferred into tubes containing 9 mL of sterile distilled water until a final dilution of 10^{-10} was obtained. Subsequently, 1 mL of the suspension from the 10^{-10} dilution was transferred into a sterile Petri dish containing the molten culture medium. The culture medium was added first until the bottom surface of the Petri dish was covered, after which the sample suspension was added and mixed evenly. One Petri dish was used



for each sample, with no technical replication. The inoculated media were maintained at room temperature in the microbiological isolation room for 24 h. Colonies were counted manually by dividing the Petri dish surface into four quadrants. Plates containing 30–300 colonies were selected for observation and enumeration according to the laboratory practical guideline used in this study. Colony abundance was reported as the observed colony count per plate and bacterial concentration was calculated as colony forming units per milliliter (CFU/mL) using the equation:

$$\text{CFU/mL} = \frac{N \times D}{V} \quad (1)$$

Where:

N = Number of colonies counted

D = Dilution

V = Volume of inoculum plated (mL)

4. Phenotypic Characterization of Bacterial Isolates

Single, clearly visible colonies were selected for preliminary phenotypic characterization. One isolate from each sample was used for cell morphology observation and Gram staining. A separate isolate from each sample was used for Ziehl–Neelsen staining, and another separate isolate from each sample was used for the citrate utilization test. Selected colonies were aseptically transferred using a sterile inoculating loop and prepared as smears on glass slides. Colony morphology was recorded based on the observable colony form and color. Cell morphology, Gram staining, and Ziehl–Neelsen staining were examined using a light microscope at 4×, 10×, 40×, and 100× magnifications. Cell morphology was clearly observed at 40× magnification, whereas Gram-stained cells were observable at several magnifications, with the clearest visualization obtained at 40×. The Ziehl–Neelsen staining results were observable at 10× magnification. Documentation of microscopic observations was presented using the magnification that provided the clearest visualization.

5. Gram and Ziehl–Neelsen Staining

Gram staining was performed by transferring the isolate onto a glass slide using an inoculating loop and preparing a bacterial smear. The smear was flooded with gentian violet and allowed to stand for 1 min, followed by rinsing with running water. Iodine solution was then applied and allowed to stand for 1 min, followed by rinsing with water. The preparation was subsequently decolorized with alcohol until the purple color disappeared, followed by counterstaining with safranin for 1 min and rinsing with water. The stained preparation was then examined microscopically. Ziehl–Neelsen staining was performed using an isolate different from that used for Gram staining. The bacterial smear was flooded with fuchsin and heated for 5 min. The preparation was subsequently treated with 3% HCl and counterstained with methylene blue. The stained preparation was then examined microscopically to characterize the acid-fast staining reaction of the isolate.

6. Citrate Utilization Test

The citrate utilization test was performed using Simmons Citrate Agar (SCA). The inoculating loop was heated and used to collect the bacterial isolate. The SCA medium was opened aseptically, and the inoculating loop was reheated before the isolate was streaked in a zigzag pattern across the surface of the medium. The inoculated medium was maintained at room temperature for 24 h. A negative citrate utilization reaction was indicated by the medium remaining green without a color change. No positive or negative controls were included in the citrate utilization test.

7. Data Analysis

The data were analyzed descriptively based on colony counts, observable colony characteristics, cell morphology, Gram staining results, Ziehl-Neelsen staining results, and citrate utilization results. Because the study used one sample from each source, one Petri dish per sample, and one isolate for each characterization procedure, no biological or technical replication and no inferential statistical analysis were performed. The findings were therefore interpreted as descriptive observations and preliminary phenotypic characterization rather than definitive identification at the genus or species level. The observed phenotypic characteristics of the isolates were described across the two sample sources to identify similarities and differences in their microbiological profiles, without interpreting the colony counts as a direct comparison of bacterial density between the samples.

RESULTS

1. Colony Growth Characteristics

Table 1. Number of Bacterial Colonies Recovered from Each Environmental Sample

Sample	Media	Number of Colonies in Quadrant				Number of Colonies
		I	II	III	IV	
Table wiping cloth water	Potato Dextrose Agar (PDA)	80	76	72	70	298
Floor mop water	Nutrient Agar (NA)	26	25	19	12	82

Bacterial colony growth was successfully observed in both environmental samples after incubation on the respective culture media. As presented in Table 1, the used table wiping cloth water sample cultured on Potato Dextrose Agar (PDA) produced a total of 298 colonies, whereas the used floor mop water sample cultured on Nutrient Agar (NA) produced 82 colonies. The combined colony count from both samples was 380 colonies. Representative bacterial colony growth observed on both culture media is presented in Figure 1.

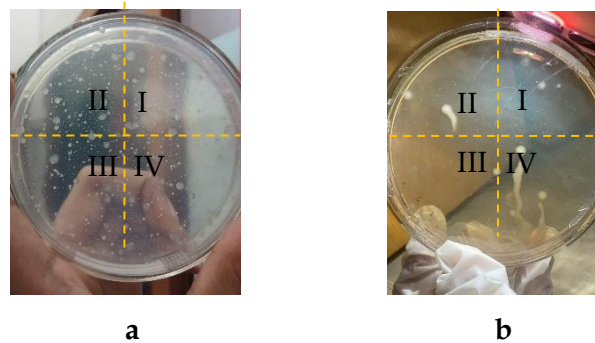


Figure 1. Bacterial Colony Growth on Culture Media: (a) Colony Growth on PDA Inoculated with Used Table Wiping Cloth Water; (b) Colony Growth on NA Inoculated with Used Floor Mop Water

Table 2. Bacterial Concentration

Sample	D	V	N	Calculated bacterial concentration
Table Wiping Cloth Water (PDA)	10^{-10}	1 mL	298	$\frac{298 \times 10^{10}}{1} = 2,98 \times 10^{12}$ CFU/mL
Floor mop water (NA)	10^{-10}	1 mL	82	$\frac{82 \times 10^{10}}{1} = 8,2 \times 10^{11}$ CFU/mL

Based on the CFU/mL calculation, the used table wiping cloth water sample yielded an estimated bacterial concentration of 2.98×10^{12} CFU/mL, whereas the used floor mop water sample yielded 8.20×10^{11} CFU/mL. These values were calculated from the colony counts obtained at a 10^{-10} dilution using 1 mL of inoculum. Because the two samples were cultured using different media, the calculated CFU/mL values represent bacterial growth under their respective culture conditions and were not used for direct comparison of bacterial density between the two samples.

2. Bacterial Cell Morphology

Table 3. Morphological Characteristics of Bacterial Isolates

Sample	Magnification	Morphology
Table Wiping Cloth Water (PDA)	40x	Coccus
Floor mop water (NA)	40x	Coccus

Microscopic observation revealed that bacterial isolates recovered from both environmental samples exhibited similar cell morphology. As shown in Table 3, both isolates were identified as coccus-shaped bacteria when observed under 40× magnification. Representative microscopic observations of the bacterial isolates are presented in Figure 2.

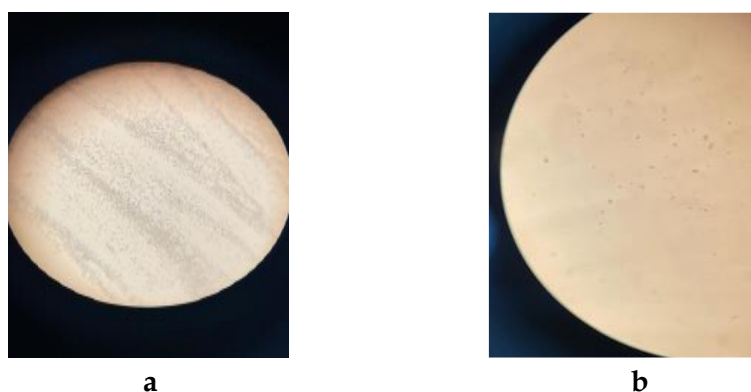


Figure 2. Morphology of Bacterial Isolates at 40× Magnification: (a) Isolate Recovered from Used Table Wiping Cloth Water; (b) Isolate Recovered from Used Floor Mop Water

3. Gram Staining Characteristics

Table 4. Gram Staining Result of Bacterial Isolates

Sample	Color	Magnification	Interpretation
Table wiping cloth water (PDA)	Red	40x	Gram-negative
Floor mop water (NA)	Red	40x	Gram-negative

The Gram staining results demonstrated that both bacterial isolates exhibited similar staining characteristics. As summarized in Table 4, the isolates appeared red after Gram staining, indicating a Gram-negative reaction. Representative microscopic images of the Gram staining results are shown in Figure 3.

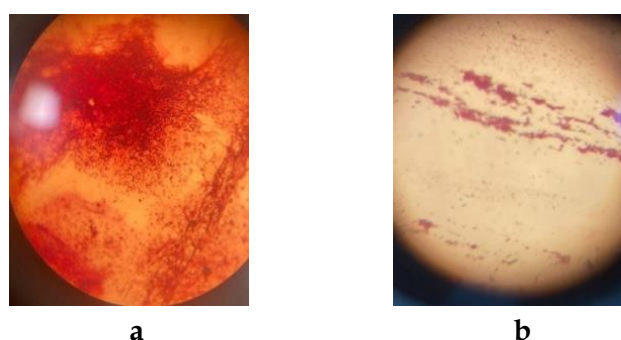


Figure 3. Gram Staining of Bacterial Isolates at 40× Magnification: (a) Isolate Recovered from Used Table Wiping Cloth Water; (b) Isolate Recovered from Used Floor Mop Water

4. Ziehl-Neelsen Staining Characteristics

Table 5. Ziehl-Neelsen Acid-Fast Staining Result of Bacterial Isolates

Sample	Color	Magnification	Interpretation
Table wiping cloth water (PDA)	Blue	10x	non-acid-fast
Floor mop water (NA)	Blue	10x	non-acid-fast

The results of Ziehl-Neelsen acid-fast staining showed consistent staining patterns for both bacterial isolates. As presented in Table 5, both isolates appeared blue under 10× magnification,

indicating that they were non-acid-fast bacteria. Representative microscopic observations are presented in Figure 4.

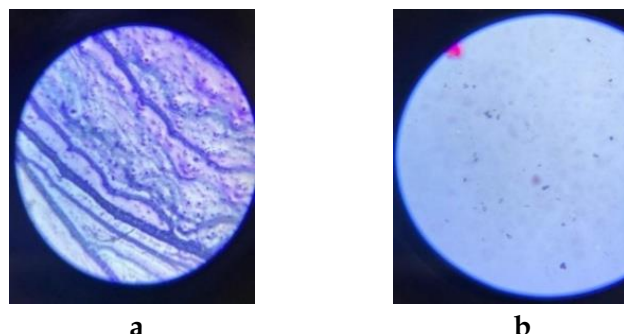


Figure 4. Ziehl-Neelsen Acid-Fast Staining of Bacterial Isolates at 10× Magnification: (a) Isolate Recovered from Used Table Wiping Cloth Water; (b) Isolate Recovered from Used Floor Mop Water

5. Citrate Utilization Test Results

Table 6. Citrate Utilization Test Results of Bacterial Isolates

Sample	Color	Interpretation
Table wiping cloth water (PDA)	Green	Negative
Floor mop water (NA)	Green	Negative

The citrate utilization test performed on Simmons Citrate Agar (SCA) showed similar results for both bacterial isolates. As summarized in Table 6, the culture medium remained green after incubation, indicating a negative citrate utilization reaction and suggesting that neither isolate was able to utilize citrate as the sole carbon source. Representative results of the citrate utilization test are presented in Figure 5.



Figure 5. Citrate Utilization Test on Simmons Citrate Agar (a) Isolate Recovered from Used Table Wiping Cloth Water; (b) Isolate Recovered from Used Floor Mop Water

DISCUSSION

1. Colony Growth Characteristics

Bacterial colonies were successfully recovered from both domestic environmental samples, with 298 colonies obtained from the used table wiping cloth water cultured on Potato Dextrose Agar (PDA) and 82 colonies from the used floor mop water cultured on Nutrient Agar (NA) (Table 1). The

observed growth indicates that both samples contained microorganisms capable of growing under the culture conditions applied in this study. NA was used to isolate bacteria from the used floor mop water, consistent with its general-purpose composition and ability to support the growth of various bacterial groups (Wahyuni et al., 2024). Bacterial growth on culture media is also consistent with Rahmah et al. (2023), who reported bacterial growth on NA used for microbial isolation from a laboratory environment. The recovery of colonies from both samples therefore provided isolates suitable for subsequent characterization.

The bacterial growth observed in the used table wiping cloth water cultured on PDA was an interesting finding in this study. PDA was initially used to assess the possible presence of fungi; however, no fungal growth was observed, whereas bacterial colonies were recovered. This observation indicates that microorganisms recovered on a culture medium are not necessarily restricted to the microbial group that the medium is primarily intended to support. Basu et al. (2015) reported the nutrient composition and culture conditions can influence which microbial groups are able to grow and become detectable through culture-based methods. Ribeiro et al. (2025) likewise demonstrated that PDA can support the growth of certain bacterial groups following optimization of the medium conditions (Basu et al., 2015; Ribeiro et al., 2025). Thus, the bacterial growth observed on PDA in the present study may reflect the ability of the recovered isolates to grow under the nutritional conditions provided by the medium rather than indicating an inappropriate use of PDA.

The characteristics of the sample sources also provide context for the observed growth. The used floor mop water was obtained after a single cleaning of one room and appeared slightly cloudy and yellowish, with visible dust particles. In contrast, the used table wiping cloth water was obtained by squeezing water from tissue used to clean a single glass table that was dusty and had dried liquid stains. During cleaning, microorganisms present on surfaces, dust, and attached materials may be transferred into the cleaning medium. However, the 298 colonies obtained on PDA and 82 colonies obtained on NA cannot be interpreted as evidence that one sample had a higher bacterial density than the other. The use of different culture media may result in differences in microbial recovery (Basu et al., 2015; Ribeiro et al., 2025). Based on the colony counts and the applied dilution factor, the estimated bacterial concentrations were 2.98×10^{12} CFU/mL for the used table wiping cloth water sample and 8.20×10^{11} CFU/mL for the used floor mop water sample. These values represent the culturable bacterial concentrations recovered under the respective culture conditions and should therefore be interpreted in relation to the different media used for each sample rather than as a direct comparison of bacterial density. The recovery of culturable bacteria from both cleaning-water samples indicates that used cleaning media may retain viable microorganisms originating from the surfaces encountered during cleaning. This finding is relevant to domestic sanitation because cleaning materials can act as carriers of microorganisms after contact with household surfaces. The recovered isolates were subsequently characterized through microscopic observation, staining procedures, and biochemical testing to obtain their preliminary phenotypic profiles.

2. Bacterial Cell Morphology

Microscopic examination showed that the isolates recovered from both the used floor mop water and used table wiping cloth water exhibited coccoid cell morphology, with the clearest



visualization obtained at 40× magnification. The similarity indicates that both isolates shared the same basic morphological characteristic within the parameters observable in this study. Coccoid bacterial isolates have also been reported in various environmental sources, including the samples examined by Wulandhani et al. (2024) and Pettalolo et al. (2025). However, similarity in cell shape does not indicate that isolates from different sources represent the same bacterium, as coccoid morphology occurs across diverse bacterial groups.

The presence of coccoid cells in both samples may be associated with microorganisms transferred during cleaning activities. The used floor mop water came into contact with floor surfaces and dust particles, whereas the used table wiping cloth water originated from cleaning a surface that was previously dusty and contained dried stains. Such contact provides an opportunity for environmental microorganisms to be transferred into the cleaning media. Nevertheless, cellular arrangement could not be determined in the present study, and therefore the morphological characterization was limited to cell shape.

Cell morphology provides an initial basis for bacterial characterization but is insufficient for determining bacterial identity at the genus or species level. Phenotypic characterization generally combines morphological observations with staining and physiological or biochemical tests to obtain a more comprehensive profile (Wulandhani et al., 2024; Gergonius & Yuni, 2016). Thus, the coccoid morphology observed in both isolates was considered together with the results of Gram staining, Ziehl-Neelsen staining, and citrate utilization testing.

3. Gram Staining Characteristics

Gram staining showed that isolates from both the used floor mop water and used table wiping cloth water exhibited a Gram-negative reaction, characterized by red to pink coloration of the bacterial cells (Table 3). This coloration indicates that the gentian violet-iodine complex was not retained following decolorization, allowing the cells to take up the safranin counterstain. Structurally, this characteristic is associated with the relatively thin peptidoglycan layer and the presence of an outer membrane in Gram-negative bacteria, which facilitate the removal of the primary stain complex during decolorization (Wulandhani et al., 2024).

The Gram-negative reaction observed in both isolates is consistent with the occurrence of Gram-negative bacteria previously reported in environmental and water samples. Rahmah et al. (2023) reported Gram-negative bacteria on culture media used for microbial isolation from a laboratory environment, whereas Nurrusyda et al. (2024) employed Gram staining as an initial characterization step for bacterial isolates recovered from water samples (Rahmah et al., 2023; Nurrusyda et al., 2024). These findings indicate that Gram-negative bacteria can occur in diverse environments associated with human activities. However, a shared Gram reaction cannot establish that the two isolates have the same identity because Gram-negative bacteria comprise diverse groups with different physiological characteristics.

The interpretation of Gram staining should also consider technical aspects of the procedure. Smear quality and the decolorization step can influence the final staining pattern and consequently affect interpretation. In the present study, the red to pink coloration observed in both isolates was interpreted as a Gram-negative reaction under the applied conditions. This characteristic

complemented the morphological observations and contributed to the preliminary phenotypic profile before being considered together with the Ziehl–Neelsen and citrate utilization results.

4. Ziehl–Neelsen Staining Characteristics

Ziehl–Neelsen staining of both isolates showed predominantly blue coloration, with some areas appearing purple (Table 4). This pattern did not show strong retention of carbol fuchsin, as expected for acid-fast bacteria, and the isolates were therefore considered non-acid-fast under the conditions tested. The result provides additional information regarding the cell-wall characteristics of the isolates following the Gram-negative reaction observed previously.

Ziehl–Neelsen staining is used to detect the ability of bacterial cells to retain carbol fuchsin following decolorization. Acid-fastness is associated with lipid-rich cell-wall characteristics, particularly the presence of mycolic acids in mycobacterial groups (Vilchèze & Kremer, 2017). The predominantly blue coloration observed in this study indicates that the isolates did not strongly retain the primary stain under the applied conditions. However, this finding only describes the characteristics of the examined isolates and cannot be interpreted as evidence that acid-fast bacteria were completely absent from the original samples. The sensitivity of microscopic examination may be influenced by organism abundance, smear quality, staining procedures, and observer performance (Steingart et al., 2006).

The use of Ziehl–Neelsen staining in this study provided additional information that could not be obtained from Gram staining alone. Nevertheless, one isolate from each sample was examined and no positive or negative control was included. These conditions should be considered when interpreting the results. Accordingly, the non-acid-fast reaction represents part of the preliminary phenotypic characterization rather than definitive evidence for bacterial identity.

5. Citrate Utilization Characteristics

The citrate utilization test produced negative reactions for both isolates, as indicated by the Simmons Citrate Agar (SCA) medium remaining green after 24 h of incubation. This result indicates that citrate utilization as the sole carbon source was not detected under the conditions applied. Gergonius and Yuni (2016) likewise reported negative citrate utilization reactions in certain bacterial isolates, characterized by the absence of a color change in the medium.

The citrate test provides physiological information that complements morphological and staining observations because it assesses a metabolic characteristic of the isolate. In the present study, the negative reactions observed for both isolates indicate similarity in the metabolic characteristic evaluated. However, this result alone is insufficient for bacterial identification because citrate utilization represents only one physiological characteristic that can be assessed during bacterial characterization. A broader biochemical profile would require additional metabolic assays.

Overall, the characterization results showed that the isolates from both samples shared a similar preliminary phenotypic profile: coccoid morphology, a Gram-negative reaction, a non-acid-fast reaction by Ziehl–Neelsen staining, and a negative citrate utilization reaction. This profile indicates similarity in the phenotypic characteristics examined, although it does not establish that the isolates belong to the same species or even the same genus. The recovery of isolates with these



characteristics from domestic cleaning media provides an initial indication that water used to clean household surfaces may carry bacteria capable of growing under specific culture conditions.

The findings should also be interpreted within the scope of the study design. One sample from each source and one culture plate at the final dilution were used, making the data more appropriately regarded as descriptive observations rather than representative estimates of all domestic cleaning media. In addition, the use of different media, NA and PDA, means that the colony counts cannot be directly compared as measures of bacterial density. Within this scope, the 298 and 82 colonies describe the growth observed under the respective culture conditions, while the morphological, staining, and citrate test results provide a preliminary phenotypic profile of the recovered isolates.

The contribution of this study lies in providing an initial description of the phenotypic characteristics of bacteria recovered from used floor mop water and used table wiping cloth water, two media generated through domestic cleaning activities. The combination of morphological observation, Gram staining, Ziehl-Neelsen staining, and citrate utilization testing provides broader information than colony growth observation alone. This profile can serve as a basis for subsequent studies involving larger sample sizes and replication, together with additional biochemical assays and molecular identification, such as 16S rRNA gene analysis, to investigate the identity and diversity of the isolates more accurately.

CONCLUSIONS

This study demonstrated that bacterial isolates recovered from used floor mop water and used table wiping cloth water exhibited similar preliminary phenotypic profiles, characterized by coccoid cell morphology, a Gram-negative reaction, non-acid-fast staining by Ziehl-Neelsen staining, and negative citrate utilization. These findings indicate that used household cleaning media may carry bacteria capable of growing under specific culture conditions, highlighting their relevance to environmental microbiology and domestic sanitation.

The characteristics obtained in this study represent preliminary phenotypic characterization and do not establish the identity of the isolates at the genus or species level. Further studies should expand the characterization through additional biochemical assays followed by molecular identification, such as 16S rRNA gene analysis, to obtain more accurate identification and a broader understanding of bacterial diversity. The use of identical culture conditions for all samples may also be considered in future studies when direct comparisons of colony growth are intended.

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