# Selection and Characterization of *Lactobacillus* sp Bacteria from Vermicompost as Probiotic Candidates

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**Abstract.** Vermicompost content many bacteria that was produce many organic material important. The bacteria could function as probiotics. One of these bacteria was *Lactobacillus*. *Lactobacillus* sp. bacteria are expected to have probiotic characteristics for shrimp. This study aims to select and characterize *Lactobacillus* sp. bacteria from vermicompost. The selection and characterization of microorganisms is the main step in the selection of potential probiotics. Fifty-two bacterial isolates were taken from the collected vermicompost. The bacteria were selected and characterized based on the characteristics of pH, temperature, concentration of NaCl, hemolysis and antibacterial products. The results of the study obtained from the selection were isolates LB37 and LB51 as probiotic candidates. The isolates grew lived on media with pH 4, 6, 8, and temperature of 28°C, 37C° and 45°C. Both isolates also grew in media at NaCl levels of 0.05; 3.5 and 7.5%. They are not pathogenic bacteria. Isolates LB37 and LB51 produce natural antibacterials that inhibit the growth of *Bacillus* sp and *Escherichia coli*.

**Keywords:** *Lactobacillus* sp. vermicompost, antibacterial, probiotic, shrimp.

## 1 Intoduction

Vermicompost is a type of organic fertilizer produced from the digestive process of worm intestines [1]. Vermicompost has a high nutrient content. The advantage of vermicompost is that it has N, P, K, Ca, and Mg available in balanced amounts. The availability of soil organic matter can stimulate the growth of lactic acid bacteria [2]. *Lactobacillus* sp. is one of the lactic acid bacteria that can be used as probiotics. The main requirements of probiotic bacteria are resistance to acid and bile and the ability to attach to the intestinal mucosa. In addition, they can produce antibacterials to suppress the growth of enteric pathogenic bacteria. Antibacterials produced from probiotics are organic acids, acetic acid, hydrogen peroxide, diacetyl, and also bacteriocins in the form of proteins that have antibacterial properties. Then another probiotic requirement is that


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it can grow in vitro well and has stability and viability for humans [3]. Lactic acid bacteria play a role as probiotics, especially from the genus *Lactobacillus* sp. *Lactobacillus* sp. probiotic bacteria are Gram-positive bacteria that are round or rod-shaped, do not produce spores, and produce lactic acid as the main metabolite. The growth of *Lactobacillus* sp. bacteria is influenced by various factors including pH, incubation temperature, and salt content. *Lactobacillus* sp. is used as a probiotic in feed for the growth of vaname shrimp seeds. Probiotics can adapt to conditions of pH 6-7.9; and temperature 26°C-32°C and can be effective against pathogens. The concentration of the amount of probiotic dose given in shrimp feed must be balanced with the bacteria that already exist in the shrimp digestive system. If the amount of probiotics given too little will affect the health and growth of shrimp, while too much can disrupt the microbial balance in digestion [4]. Salt levels in rearing water can also affect probiotic *Lactobacillus* sp. given to shrimp through feed. Changes in salt levels that are too high can reduce the effectiveness of probiotics because these conditions can inhibit growth and activity [5]. Shrimp growth is influenced by the suitability and nutritional content of the feed provided. Feeding less or insufficient nutrients can inhibit shrimp growth. Conversely, excessive feeding and uneaten feed residue will reduce water quality [6]. The purpose of this study was to select and characterize *Lactobacillus* sp. bacteria from vermicompost as well as probiotic candidates.

## 2 Materials and Methods

### 2.1 Bacteria of *Lactobacillus* sp

The main material used in this study was *Lactobacillus* sp. bacteria from vermicompost. *Lactobacillus* sp. isolates grown using GYPA (Glucose Yeast Peptone Agar) media consisting of glucose 10 g, yeast extract 10 g, peptone 5 g, CaCO3 10 g, NaCl 50 g, and agar 15 g.

### 2.2 pH test

This test was conducted to know the effect of pH on the growth of bacterial. The pH used was pH 4, 6, and 8. Then, the isolate was inoculated on 10 ml GYP broth media in a test tube and incubated at room temperature for 48 hours.

### 2.3 Temperature test

The temperatures used were room temperature (28°C), 37°C and 45°C. Bacterial isolates were inoculated on GYP Agar media in sterile petri dishes as much as 20-25 ml and incubated for 48 hours.

### 2.4 Salt Test

This test was conducted to see the effect of salt content on the growth of bacterial isolates. The salt levels used were 0.05%; 3.5% and 7.5%. Isolates were inoculated on GYP Agar media in petri dishes with the point method. The bacteria incubated at 37°C, for ± 24 hours - 48 hours. The growing bacteria were observed for size, colony shape, colony edge shape, and colony elevation. Measurement of colony area of *Lactobacillus* sp. bacteria using vernier calipers.

### 2.5 Hemolysis test

This test is conducted to determine whether *Lactobacillus* sp. bacteria are pathogenic or not for humans and animals. The test uses Blood Agar media consisting of peptone 10 g, tryptose10 g, sodium chloride 5 g, agar 15 g, and 5% sheep blood. Isolates were inoculated by the media and it were incubated for 24 hours. Vibrio sp. of pathogen bacteria was used as positive control.

### 2.6 Antibacterial activity test.

The antibacterial activity test used the disc paper test method. Tests were carried out by soaking sterile paper discs for 24 hours with antibacterial culture starters, each antibacterial culture without neutralization and neutralized antibacterial using 1 M NaOH to reach pH 7. Making a suspension of test bacteria by taking 1 ose of bacteria and inoculating it into a test tube containing 10 ml of sterile NaCl. Vortex the suspension and compare the suspension turbidity with Mc Farland 0.5. Performed the swabbing procedure by dipping a sterile cotton bud into a test tube containing a suspension and swabbing on a Petri dish that has 20-25 ml of NA solid media. Spread the test bacteria to NA solid media using cotton bud until evenly distributed. After that, paper disks that have been soaked for 24 hours are taken using tweezers and placed on the surface of the NA media. Both types of antibacterial were tested on different plates and tested on *Bacillus* sp and *E. coli*.

## 3 Result

### 3.1 Temperature and pH test.

Based on the selection results of 52 colonies of *Lactobacillus* sp. bacteria in the pH test, only 14 colonies were obtained that were able to grow at pH 4, 6, and 8. From the 14 colonies selected, they have differences from each other in the pH test. The differences of 14 colonies are distinguished based on being able to grow at pH 6, being able to grow at pH 8, and being able to grow at all three pH, namely 4, 6, and 8 (Table 1).

**Table 1.** Selection Results of *Lactobacillus* sp. colonies at many pH and Temperature.

| Colony | pH | | | Temperature | | |
|---|---|---|---|---|---|---|
| | 4 | 6 | 8 | 28°C | 37°C | 45°C |
| **LB1** | + | ++ | +++ | ++ | +++ | + |
| LB2 | + | + | ++ | NT | NT | NT |
| LB3 | + | + | + | NT | NT | NT |
| LB4 | + | + | + | NT | NT | NT |
| LB5 | + | + | + | NT | NT | NT |
| **LB6** | + | +++ | ++ | +++ | ++ | + |
| LB7 | + | + | + | NT | NT | NT |
| LB8 | + | + | + | NT | NT | NT |
| LB9 | + | + | + | NT | NT | NT |
| **LB10** | + | ++ | +++ | + | + | + |
| LB11 | + | + | + | NT | NT | NT |
| LB12 | + | + | + | NT | NT | NT |
| LB13 | + | + | + | NT | NT | NT |
| LB14 | + | + | + | NT | NT | NT |
| LB15 | + | + | + | NT | NT | NT |
| **LB16** | ++ | ++ | ++ | + | + | + |
| LB17 | + | + | + | NT | NT | NT |
| LB18 | + | + | + | NT | NT | NT |
| LB19 | + | + | + | NT | NT | NT |
| LB20 | + | + | + | NT | NT | NT |
| LB21 | + | + | + | NT | NT | NT |
| LB22 | + | + | + | NT | NT | NT |
| LB23 | + | + | + | NT | NT | NT |
| LB24 | + | + | + | NT | NT | NT |
| LB25 | + | + | + | NT | NT | NT |
| LB26 | + | + | + | NT | NT | NT |
| LB27 | + | + | + | NT | NT | NT |
| LB28 | + | + | + | NT | NT | NT |
| **LB29** | + | +++ | ++ | ++ | +++ | + |
| LB30 | + | + | + | NT | NT | NT |
| LB31 | + | + | + | NT | NT | NT |
| LB32 | + | + | + | NT | NT | NT |
| LB33 | + | + | + | NT | NT | NT |
| LB34 | + | + | + | NT | NT | NT |
| **LB35** | + | +++ | + | + | + | + |
| **LB36** | + | ++ | +++ | + | + | + |
| **LB37** | + | +++ | ++ | +++ | ++ | + |
| **LB38** | + | ++ | +++ | +++ | ++ | ++ |
| LB39 | + | + | + | NT | NT | NT |
| LB40 | + | + | + | NT | NT | NT |
| **LB41** | + | ++ | +++ | ++ | ++ | ++ |
| LB42 | + | + | + | NT | NT | NT |
| LB43 | + | + | + | NT | NT | NT |
| **LB44** | + | + | +++ | ++ | +++ | + |
| LB45 | + | + | + | NT | NT | NT |
| LB46 | + | + | + | NT | NT | NT |
| LB47 | + | + | + | NT | NT | NT |
| **LB48** | + | +++ | +++ | + | + | + |
| LB49 | + | + | + | NT | NT | NT |

| | | | | | | |
|---|---|---|---|---|---|---|
| **LB50** | + | +++ | ++ | + | + | + |
| **LB51** | + | +++ | +++ | ++ | ++ | ++ |
| LB52 | + | + | + | NT | NT | NT |

Notes: + Low turbidity or small colony size, ++ medium turbidity or medium colony size, +++ high turbidity or large colony size, NT (No temperature test performed).

Based on the 14 colonies obtained, only one colony was able to grow at all three pH, namely colony LB16. From the Table 1, LB16 colonies can grow at pH 4, 6, and 8. This can be seen from the bacterial growth test which produces turbidity. Its mean, the LB16 colony can adapt to this pH for growth. Colonies of LB48 and LB51 have very turbid growth test results when compared to other types of colonies, namely at pH 6 growth, and produce very turbid growth tests at pH 8. In colony LB44, the optimum pH for growth is only at pH 8, this is indicated by its growth test which produces turbidity in the media. Colonies of LB1, LB6, LB10, LB29, LB36, LB37, LB38, LB41, and LB50 are colonies that can grow at an optimum pH of 6 and 8.

It can be seen that the 14 colonies of bacteria could survive the pH test. From the 14 colonies, 8 colonies were selected to be tested at different temperatures. From the temperature test, colony growth based from the size of the growing colonies. Colonies of LB38, LB41, and LB51 were able to grow at room temperature (28°C), 37°C and 45°C. while colonies LB1, LB29, and LB44 were able to grow optimally at 37°C, and colonies LB6 and LB37 were able to grow optimally at room temperature (28°C).

### 3.2 Salt test

There are 52 types of *Lactobacillus* sp bacterial colonies that were selected for their growth. The selection resulted in 14 bacterial colonies.

**Table 2.** Morphological Characters of Colonies of *Lactobacillus* sp.

| Isolate | Colony Shape | | | Colony Edge | | | Colony Elevation | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0,05% | 3,5 % | 7,5 % | 0,05% | 3,5% | 7,5% | 0,05 % | 3,5 % | 7,5 % |
| LB1 | Circular | Circular | Circular | Entire | Entire | Entire | Umbonate | Convex | Convex |
| LB6 | Irregular | Circular | Circular | Lobate | Entire | Entire | Umbonate | Convex | Convex |
| LB10 | Circular | Circular | Irregular | Undulate | Entire | Entire | Convex | Convex | Umbonate |
| LB16 | Circular | Circular | Circular | Entire | Entire | Ne | Convex | Convex | Convex |
| LB29 | Circular | Irregular | Irregular | Entire | Lobate | Entire | Convex | Convex | Convex |
| LB35 | Irregular | Irregular | Irregular | Entire | Curled | Lobate | Raised | Raised | Raised |
| LB36 | Irregular | Irregular | Irregular | Entire | Lobate | Curled | Convex | Umbonate | Umbonate |
| LB37 | Irregular | Irregular | Irregular | Entire | Entire | Curled | Convex | Convex | Raised |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| L B38 | Ire gular | Ire gular | Ire gular | Lo bate | L obate | L obate | Um bonate | FR | Flat |
| L B41 | Ire gular | Ire gular | Ire gular | Lo bate | L obate | E ntire | Um bonate | Con vex | Con vex |
| L B44 | Ire gular | Ire gular | Ire gular | Lo bate | L obate | L obate | Um bonate | Con vex | Flat |
| L B48 | Cir cular | Cir cular | Cir cular | Lo bate | E ntire | L obate | Rais ed | Um bonate | Con vex |
| L B50 | Ire gular | Cir cular | Cir cular | Un dulate | L obate | E ntire | Um bonate | Con vex | Con vex |
| L B51 | Cir cular | Cir cular | Cir cular | Ent ire | E ntire | E ntire | Rais ed | Con vex | Con vex |

The 14 selected bacterial colonies were grown on media with different salt levels. Bacterial colonies produce different morphological characters (Table 2). Colony morphological characterization includes color, shape, edge shape, and elevation.

**Table 3.** Morphology Size Colonies area of bacteria.

| No | Bacteria | Bacterial Colony Area (cm) | | |
|---|---|---|---|---|
| | | Media of salt contrations 0.05% | Media of salt contrations 3.5% | Media of salt contrations 7.5% |
| 1 | LB1 | 0.44 | 0.44 | 0.32 |
| 2 | LB6 | 0.52 | 0.36 | 0.28 |
| 3 | LB10 | 0.48 | 0.4 | 0.2 |
| 4 | LB16 | 0.6 | 0.56 | 0.2 |
| 5 | LB29 | 0.52 | 0.24 | 0.2 |
| 6 | LB35 | 0.24 | 0.24 | 0.16 |
| 7 | LB36 | 0.44 | 0.36 | 0.28 |
| 8 | LB37 | 0.28 | 0.12 | 0.08 |
| 9 | LB38 | 0.24 | 0.2 | 0.2 |
| 10 | LB41 | 0.4 | 0.32 | 0.24 |
| 11 | LB44 | 0.24 | 0.2 | 0.16 |
| 12 | LB48 | 0.32 | 0.24 | 0.16 |
| 13 | LB50 | 0.4 | 0.36 | 0.28 |
| 14 | LB51 | 0.72 | 0.48 | 0.48 |

The selection results of 14 colonies showed a difference in size. Colonies growing on low salt content media showed better growth characterized by larger colony size than those growing on media with higher salt concentration (Table 3).

### 3.3 Hemolysis test

The results obtained from the hemolysis test using the inoculation method. The 14 isolates have different colony morphological characters. They do not show the presence of clear zones as shown (Figure 1).

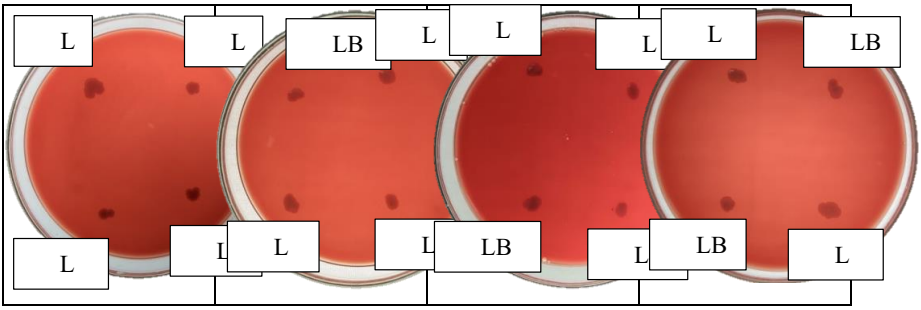


**Fig. 1.** Hemolysis test of *Lactobacillus* sp.

### 3.4 Antibacterial Test

The 8 colonies of *Lactobacillus* sp. which can grow at room temperature to produce antibacterial. The antibacterial test used *Bacillus* sp and *E. coli*. The antibacterial compound from *Lactobacillus* sp is a natural antibacterial compound (acidic compound). Apart from this, the antibacterial compound is neutralized. Colonies of LB6, LB29, LB44 able to produce an inhibitory zone on colonies of *Bacillus* sp. Colonies of LB37, and LB51 was able to produce an inhibitory zone on two bacteria, namely *Bacillus* sp and *E. coli* at acidic compound. There are not neutralized antibiotic compounds that produce antibacterial properties (Table 4).

**Table 4.** Screening of antimicrobial activity

| *Lactobacillus* sp. Colonies | Diameter of the inhibition zone (cm) | | | |
|---|---|---|---|---|
| | *Bacillus* sp. | | *E. coli* | |
| | Acidic Filtrate | Neutral Filtrate | Acidic Filtrate | Neutral Filtrate |
| LB1 | - | - | - | - |
| LB6 | ± 0,1 | - | - | - |
| LB29 | ± 0,2 | - | - | - |
| LB37 | ± 0,1 | - | ± 0,2 | - |
| LB38 | - | - | - | - |
| LB41 | - | - | - | - |
| LB44 | ± 0,2 | - | - | - |
| LB51 | ± 0,2 | - | ± 0,2 | - |

Description: - (no inhibition zone)

# 4 Discussion

## 4.1 Effect of Media pH

Factors that affect the growth of a microbe consist of pH, temperature, oxygen, osmosis pressure, and radiation [7]. Bacterial growth in liquid media is characterized by turbidity, sediment, biofilm formation, gas production, and colony discoloration. In this study, the *Lactobacillus* sp. test inoculated to liquid media formed turbidity [8]. The pH of the media affects the growth of *Lactobacillus* sp. [9]. pH affects the activity of enzymes needed to catalyze reactions that support bacterial growth. pH that is not optimal in the environment can interfere with the function of enzymes, thus inhibiting bacterial growth [10]. Changes in pH affect enzyme activity. Enzymes have ionic properties with carboxyl and amine groups that are easily affected by pH. An inappropriate pH will cause changes in the catalytic region and conformation of the enzyme. When the pH changes, the degree of ionization of the enzyme also changes. If pH is too low or high, the enzyme becomes inactive [11].

Based on the data obtained, the LB16 colony was able to grow at pH 4. This shows that the LB16 colony is included in the group of acidophilic bacteria. Some bacteria that cannot grow at pH 4 such as colonies LB1, LB6, LB10, LB29, LB35, LB36, LB37, LB38, LB41, LB44, LB48, LB50, and LB51 are neutrophilic bacteria [12]. The genus *Lactobacillus* sp. can grow at varying pH ranging from 4.5 to 6.6.

Some strains can even grow at lower pH [13]. Some colonies do not grow at pH 4 because the pH level is too acidic so that the bacterial cell membrane is disrupted by hydrogen ions. In addition, there are several compounds that enter the cell, causing disruption of the cell structure. When the pH is low, ionization and changes in the internal pH of the cell will occur. These changes can inhibit the delivery of amino acids from RNA so that protein synthesis is disrupted. Thus, bacterial growth is disrupted and it can cause bacterial death.

Colonies that can grow at acidic pH have many protonated amino acids to maintain their catalytic activity. Bacteria rely on proton pumps to remove excess H+ from the cell to keep the intracellular pH stable [14]. At optimum pH, organisms living in it will be able to survive. However, cells will be disrupted if the environmental pH is too high or too low. This disruption can cause bacterial cell death [15].

## 4.2 Temperature test

Another factor that affects growth is temperature. Based on research data, the growth test of *Lactobacillus* sp. to temperature is included in the mesophilic bacteria group, which grows at a temperature range of 20°C - 45°C [16]. The effect of temperature on microbial growth is influenced by enzyme activity. If there is a change in the structure of the enzyme protein, enzyme activity decreases. In this study, LB38, LB41, and LB51 colonies can grow at all three temperatures. At the optimum temperature, enzyme activity is maximum so that the enzymatic reaction occurs most quickly. Changes in enzyme temperature can affect hydrogen bonds and the active side of the enzyme which

play a role in maintaining the structure of the enzyme molecule [17]. At low temperatures, enzymes lack energy, thus reducing their ability to work optimally. Increasing the temperature to the optimum will increase enzyme activity. However, if the temperature is too high until it passes the optimum temperature, the enzyme will experience thermal denaturation which changes its structure and results in decreased enzyme activity [18]. Thus, temperature is a physical factor that affects the growth rate by affecting chemical reactions and the stability of protein molecules. Temperature significantly affects the stability of protein molecules, namely at low temperatures the protein can become less flexible, thereby reducing enzymatic activity and solubility. If at optimum temperature the protein maintains its stable three-dimensional structure and functions efficiently. At high temperatures the protein can experience denaturation, which is the damage to its three-dimensional structure due to disruption of hydrogen peroxide, hydrophobic interactions, and disulfide bonds [19]. LB51 bacterial colonies can grow optimally at room temperature (28°C), 37°C, and 45°C, while the optimum temperature for the growth of probiotic *Lactobacillus* sp. is 25°C-32°C [20]. Therefore, the LB51 colony has the potential to be used as a probiotic candidate.

### 4.3 Salt test

The salt content in the media can affect the shape, edge, and elevation of bacterial colonies. This happens because salt affects the osmotic balance in bacterial cells. The addition of salt concentration to the media causes an imbalance in osmotic pressure on the growing bacteria. In bacterial colonies that live slowly at high salt concentrations such as LB10, there is an unbalanced osmotic pressure causing fluid to leak out of the bacterial cells, causing their growth to slow down [21].

Differences in colony shape in each bacterial isolate indicate differences in type between bacterial isolates. Differences in colony shape cause typical characteristics of certain bacterial species. In addition, the shape, edge shape, and elevation of the colony are also typical properties of the bacteria [22]. Metal ions contained in salt affect enzyme production activity. The presence of metal ions can affect the active side of the enzyme and the stability of protein molecules. Metal ions can act as activators or inhibitors, thereby affecting the catalytic work of enzymes [23]. In this study, several colonies grown in media with a salt content of 0.05% showed good growth, indicated by a larger colony size compared to colonies of isolates grown in media with salt concentrations of 3.5% and 7.5%. This is in accordance with the research results of Anggraeni et al. [24] where the growth of *Lactobacillus* sp. bacteria is faster in media with low salt concentration. The growth of *Lactobacillus* sp. bacteria will be inhibited in media with high salt concentration. The right salt concentration in the media will stimulate the growth of *Lactobacillus* sp. bacteria and can inhibit the growth of unwanted bacteria. High salt levels can disrupt bacterial cell growth [25]. In conditions where the salt in the media has a higher concentration than the concentration of bacterial cell protoplasm, the protoplasm fluid will exit the bacterial cell through the plasma membrane (plasmolysis). Water moves from inside the cell through the cell membrane to the surrounding media. As a result, the protoplasm shrinks. This event is called plasmolysis. Meanwhile, if the cell is placed in a hypotonic medium, which is a solution

with a lower solute concentration than the cell, water will enter the cell because the water concentration outside the cell is higher than inside the cell. Then the cell will swell. This event is called deplasmolysis.

### 4.4 Hemolysis Test

Hemolysis test was conducted to determine the pathogenicity of isolates in humans and animals. Observation of hemolysis properties is based on the formation of hemolysis zones around bacterial colonies. The results of the hemolysis test showed that 14 colonies of *Lactobacillus* sp. bacteria were not pathogenic. This was indicated by the absence of color changes in the blood agar media. This means that *Lactobacillus* sp. bacteria cannot hemolyze red blood cells (ɣ-hemolysis). The isolate has the potential to be a probiotic. Bacteria with ɣ-hemolysis properties are bacteria that cannot utilize red blood cells as a source of nutrition [26].

### 4.5 Antibacterial Test

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*Lactobacillus* sp. is a type of lactic acid bacteria that generally produces antibacterial compounds in the form of organic acids. Antibacterial compounds produced by lactic acid bacteria can produce antibacterial compounds including lactic acid, bacteriocin, hydrogen peroxide, reutrin, diacetyl, and various other organic acids such as acetic acid, propionate, and butyrate [27]. Research data shows that there is a difference in the area of inhibition zones tested against test bacteria Bacillus sp and E. coli.

After the antibacterial was neutralized, it turned out that it could not inhibit Bacillus sp. and E. coli bacteria. Antibacterials that are not neutralized or acidic can inhibit the growth of test bacteria Bacillus sp. and E. coli. In acidic conditions, the main compound that inhibits the growth of test bacteria is organic acid produced by *Lactobacillus* sp. Neutral antibacterial compounds contain bacteriocin, hydrogen peroxide, reutrin, and diacetyl [28]. Based on research data, acidic antibacterial compounds produced by *Lactobacillus* sp. can inhibit the growth of test bacteria [29].

Colonies LB6, LB29, and LB44 produced inhibition zones only in the test bacteria Bacillus sp. The inhibition that occurred was caused by differences in the cell walls between the test bacteria of Bacillus sp. and E. coli. The difference in the cell walls in the test bacteria is because the bacteria Bacillus sp. contain a thicker peptidoglycan layer, while the bacteria E. coli contain a thinner peptidoglycan layer [30]. The inhibition mechanisms in antibacterials include inhibiting nucleic acid and protein synthesis, inhibiting enzyme activity, inhibiting the integrity of bacterial cell wall

permeability, and inhibiting cell wall synthesis [31]. In this study, antibacterial compounds from the colonies LB37 and LB51 were able to inhibit the growth of Bacillus sp. and E. coli. This inhibition is thought to inhibit protein and cell wall synthesis. This condition can affect the replication process, inhibition of enzyme activity which can interfere with various biochemical processes, disruption of the integrity and permeability of the cell membrane can cause ion imbalance and metabolite leakage [32].

The inhibition mechanism that occurs in the antibacterial compounds of the LB37 and LB51 colonies is due to the presence of organic acids produced. Organic acids can damage or weaken membrane permeability, allowing antibacterial metabolites to enter more easily, thus disrupting the internal function of the test bacteria, and increasing the effectiveness of inhibition. This disruption results in the movement of substances in and out of cells through the cell membrane. The cell membrane consists of a lipid layer with proteins that function as channels and transporters and control the exchange of ion nutrients and other substances [33]. This affects the LB37 compound and the LB51 colony can produce inhibition zones in both test bacteria.

## 5 Conclusions

The results of the selection of *Lactobacillus* sp. bacteria from vermicompost based on pH and temperature tests obtained optimally growing bacteria. There are variations in colony morphological characteristics, such as colony shape, colony edge shape, and colony elevation, with the best growth at a salt content of 0.05%. All *Lactobacillus* sp. isolates are not non-pathogenic bacteria. Antibacterial tests show that the acidic antibacterial compounds produced by *Lactobacillus* sp. LB37 and LB51 are able to inhibit the growth of test bacteria. These bacteria have the potential to be probiotics.

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