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Oral Presentation
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THE EFFECTIVENESS OF PSEUDOMONAS FLUORESCENS AS A CADMIUM METAL ABSORBER IN THE LEACHATE OF COLD WATER WASTE LANDFILLS

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ABSTRACT

Garbage is a serious problem in big cities and regions but the development of waste management is not proportional to the rate of waste piles which will undergo a decomposition process marked by physical, biological and chemical changes. The organic material in the waste undergoes decomposition to produce leachate. Organic materials and heavy metals, especially Cd metal contained in the waste, can be reduced using the Pseudomonas fluorescens bacteria on a laboratory scale. The bacteria used is one of the bacteria as an absorber of Cd metal in leachate found in Cold Water TPA. The parameter tested was the optimal absorption capacity of Cd by Leachate. This research was conducted with a density of 0.5 × 108 / ml with an optimal absorption capacity of 41.622%, 1 × 108 / ml with an optimal absorption capacity of 55.202%, 2 × 108 / ml with an optimal absorption capacity of 59.082%, 3 × 108 / ml with an optimal absorption capacity of 66.313%. and 4 × 108 / ml optimal absorption capacity of 72.045% and from the results of research conducted on Leachate by the bacteria Speudomonas fluorescens was effective in absorbing Cd metal.

Keywords: Garbage, Cadmium Metal, leachate, Pseudomonas fluorescens

INTRODUCTION

Garbage is a serious problem in big cities and regions, in line with the development of the increasing population. While the development of waste management has not kept pace with the rate of landfill, this is a problem that must be resolved immediately. One of the weaknesses of the waste disposal system is the absence of leachate processing, so far leachate has not been handled properly, it tends to be left alone so that it has great potential to pollute the environment (Adisoemanto S, 1994).

The waste in the landfill will undergo a decomposition process characterized by physical, biological, and chemical changes. Decomposition that occurs in landfills is influenced by compaction, humidity, presence of inhibiting material, water flow rate, temperature, availability of O2, microbiological population which is influenced by soil conditions. The composition of leachate is influenced by several factors, including: composition and age of waste, location and operation and landfill conditions, climate and hydrogeological conditions, humidity, temperature, pH, and level of stabilization (Tchobanoglous et al., 1993).

The waste generated by the city of Padang is 1,432 m3 per day, comes from households, social places, shops, and from industrial activities, while from parks it generates 75.5 m3 of waste and 26 m3 from offices. The total population of the city of Padang according to the Central Bureau of Statistics of Padang City until 2013 was 912,450 thousand

people. the highest composition of waste in the form of organic material is 61.91% (Cahyono et al., 1999). The organic material in the dumped waste will decompose to produce leachate. Leachate is a liquid that contains very fine dissolved and suspended substances as a result of decomposition by microbes (Soemirat, 1999).

Leachate is characterized by high levels of organic matter and contains heavy metals. Leachate can be classified as a compound that is difficult to degrade, which contains polymeric materials (macro molecules) and synthetic organic materials. In general, leachate has a very low BOD5 / COD ratio (<0.4). This very low ratio value indicates that the organic material contained in leachate is difficult to be degraded biologically. Lower comparison numbers indicate high biodegradable organic matter (Alaerts et al, 1984).

Organic matter and heavy metals contained in waste can be reduced using Pseudomonas fluorescens on a laboratory scale. In order to reduce levels of organic matter and heavy metals in the leachate of TPA Air Cold. Pseudomonas fluorescens bacteria is a bacterium that can be used as an adsorbent for Cd metal in leachate. The aim of this research was to see the ability of Pseudomonas fluorescens to absorb Cd metal in leachate.

As an effort to overcome this pollution, it is necessary to manage the leachate produced by the Air Cold TPA. Organic matter and heavy metals contained in waste can be reduced using Pseudomonas fluorescens on a laboratory scale.

MATERIAL AND METHODS

This type of research is experimental in which the researcher conducts research and takes leachate samples at cold water landfill for testing. This research was conducted in the chemical laboratory of the Pioneer College of Health Sciences (STIKES) and the Kopertis Chemical laboratory Region X. This research was conducted for 3 months in 2014

RESULT

1. Examination of Speudomonas fluorescens Bacteria Identification

A. Gram Stain Test

From the results that have been done in identifying the pseudomonas fluorescens bacteria on gram staining, the results are gram-negative in the form of a red rod.

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B. Fermentation Test

Fermentation is the process of breaking down complex compounds into simpler compounds with either an electron or hydrogen acceptor or donor in the form of organic compounds. Alcohol is the result of sugar fermentation by yeast. The basic ingredients for fermentation can be complex carbohydrates or simple carbohydrates such as sugar solution. To determine the presence or absence of alcoholic fermentation activity in the material, it can be seen based on the CO2 gas produced (seen from the presence or absence of air bubbles) and the presence or absence of alcohol produced (can smell the alcohol smell).

In the characteristics of the Pseudomonas fluorescens bacteria in the test that must be obtained in the identification of bacteria, namely sucrose (-), lactose (-), mannitol (+/-), glucose (+) and maltose (-) but on fermentation tests that have been carried out on Pseudomonas bacteria fluerescens in the form of sucrose, lactose, mannitol, glucose and maltose tests obtained the following res

Table 3.
Fermentation Test (Sugar - Sugar)

No	Tes Fermentasi	Hasil
1	Sukrosa	(-)
2	Laktosa	(-)
3	Manitol	(-)
4	Glukosa	(-)
5	Maltosa	(-)

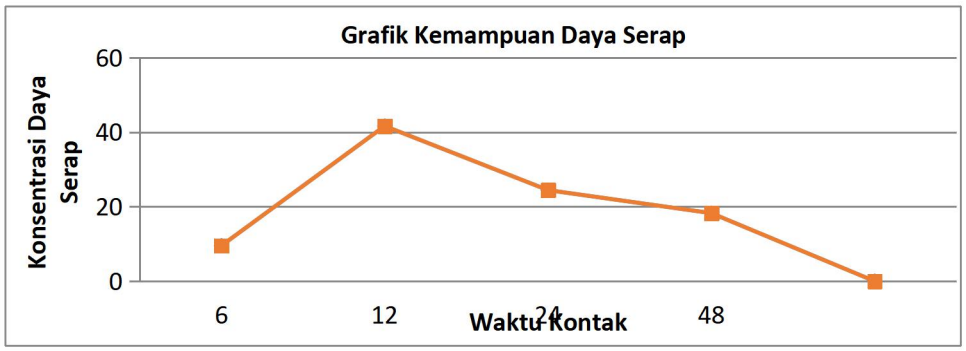
In the fermentation test process, 1-2 colonies were taken and scratched on the media contained in the test tube, then incubated for 1x24 hours so that the results were obtained.

The sugar-sugar test is carried out to identify bacteria capable of fermenting glucose, sucrose, lactose, maltose and mannitol, the results of the acidic fermentation process will lower the pH of the media and change the color of the indicator, if the negative results the bacteria cannot ferment glucose, sucrose, lactose, maltose and mannitol. And if the result is positive, the bacteria can ferment it. From the results that have been obtained, the results of mannitol should be obtained (+/-) and glucose should be (+) and the results are mannitol and glucose (-), a biochemical test is carried out to identify the pseudomonas fluorescns bacteria.

C. Biochemical Test

Biochemistry is the study of the compounds that exist in living systems, the arrangement of these compounds into cells and the chemical interactions that occur. Cells in living things are composed of biomolecules to sustain the life of cells undergoing metabolism (reactions in cells). in cell metabolism to absorb energy from food or nutrients, this energy is used to form biomolecules that make up cells. Biochemistry aims to understand how the interactions of biomolecules with each other carry these characteristics of life. In the characteristics of the Pseudomonas fluorescens bacteria in the biochemical test that must be obtained in the identification of batteries, namely TSIA (+), Mr / VP (-), SC (-), and SIM (-), the results obtained are the same as the characteristics of the Pseudomonas bacteria. fluorescens, the bacteria is Pseudomonas fluorescens.

The following are the biochemical test results obtained for the identification of bacteria, including:

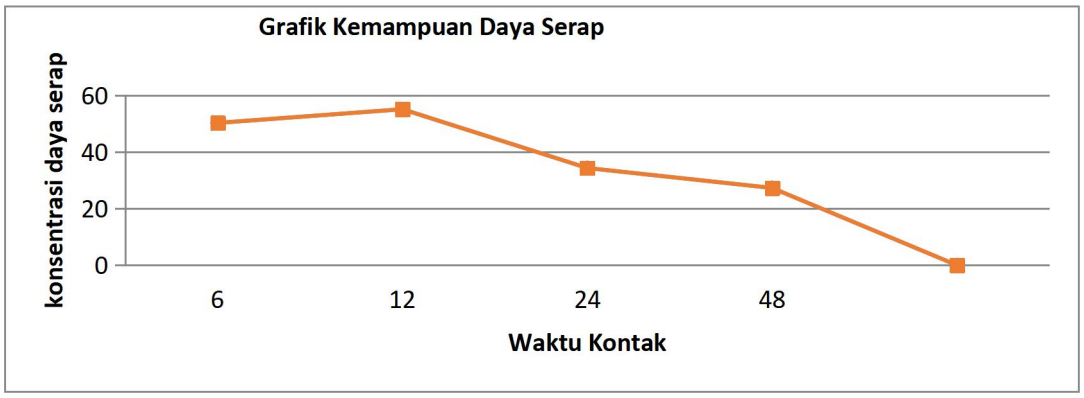


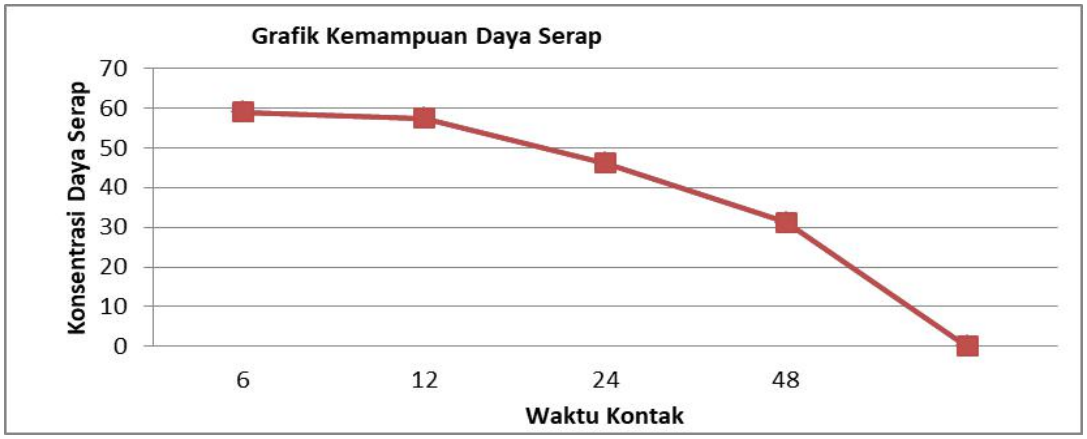
Biochemical Test

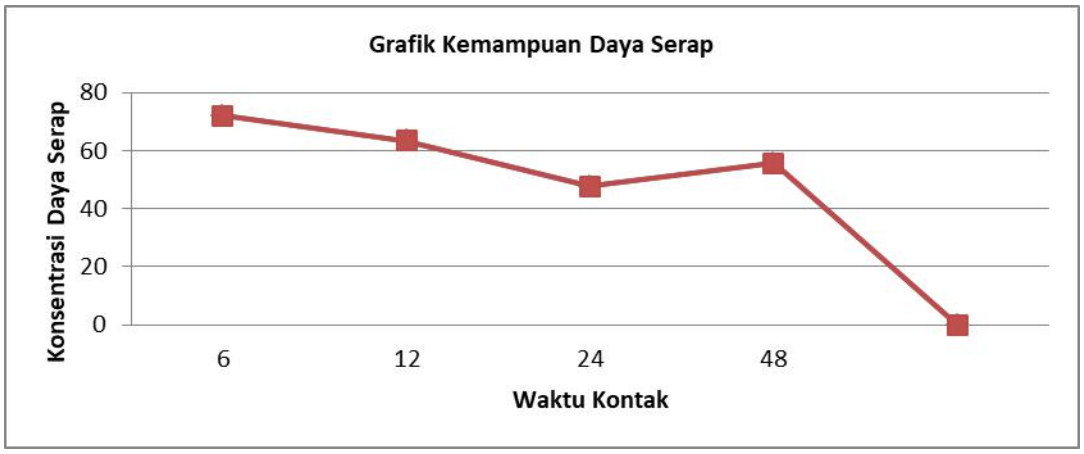
Biochemical test is for testing solutions or chemical substances from materials and processes that occur in the body of living things, in an attempt to understand life processes from a chemical side.

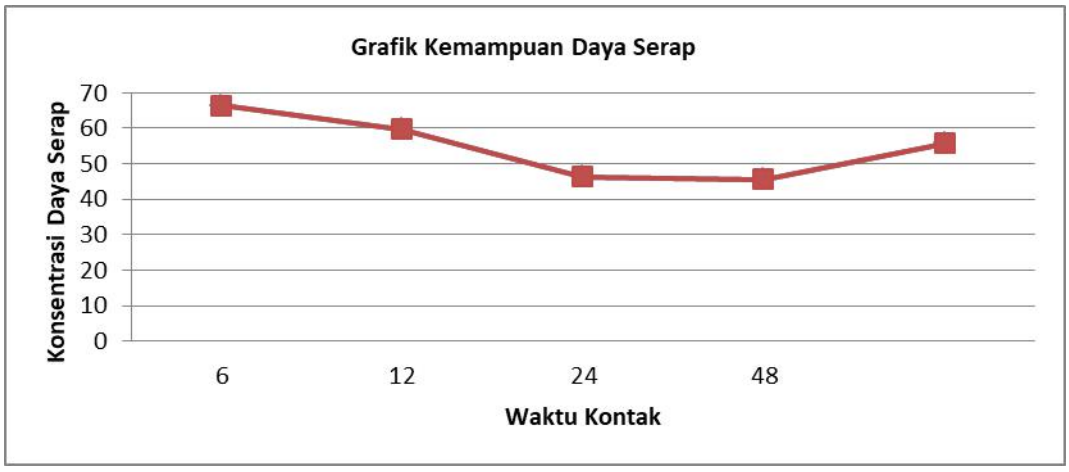
2. Ability to absorb Cd metal concentration in absorbing Pseudomonas fluorescens bacteria

Concentration and contact time are the time required for the absorption capacity which has a functional group to bond with the active side of the metal solution until the optimum time for absorption is obtained. the higher the absorption time of the metal solution, the lower the active side interaction of the adsorbate so that the absorption capacity will also decrease. The absorption capacity will decrease because the bacteria are unable to absorb Cd metal because the bacteria are dead (hemolysis), the bacteria cannot live long and at a certain room temperature









In Figure 1. The absorption of Cd metal with a density of 0.5 × 108 ml can be seen that the optimum time for absorption of Cd metal in bacteria occurs at 12 hours with an absorption concentration of 41.622% because at that time there is a balance between the functional groups of the absorption material that bind to the number of ion molecules. The metal with the solution and the bacteria is still able to bind the Cd metal, while at the 24 hour and 48 hour contact time the bacteria are unable to absorb the Cd metal because the

higher the contact time the bacteria are unable to bind the Cd metal because the bacteria occurs hemolysis (already dead).

In Figure 2.The absorption of Cd metal with a density of 1 × 10 8 ml can be seen that the optimum time for absorption of Cd metal in bacteria occurs at 12 hours with an absorption concentration of 55,202% because at that time there is a balance between the functional groups of the binding absorption material. with the number of metal ion molecules in the solution and the bacteria are still able to bind Cd metal, while at the contact time of 24 hours and 48 hours the bacteria are unable to absorb Cd metal because the higher the contact time the bacteria are unable to bind Cd metal because the bacteria hemolysis occurs (already dead) .

In Figure 3.The absorption of Cd metal with a density of 2 × 108 ml can be seen that the optimum time for absorption of Cd metal in bacteria occurs at 6 hours with an absorption concentration of 59.082% because at that time there is a balance between the functional groups of the absorption material that binds to the number of metal ion molecules in the solution and the bacteria are still able to bind Cd metal, while at the contact time of 12 hours, 24 hours and 48 hours the bacteria are unable to absorb Cd metal because the higher the contact time the bacteria are unable to bind Cd metal because the bacteria have hemolysis (already die).

In Figure 4.The absorption of Cd metal with a density of 3 × 108 ml can be seen that the optimum time for absorption of Cd metal in bacteria occurs at 6 hours with an absorption concentration of 66.313% because at that time there is a balance between the functional groups of the absorption material that binds to the number of metal ion molecules in the solution and the bacteria are still able to bind Cd metal, while at the contact time of 12 hours, 24 hours and 48 hours the bacteria are unable to absorb Cd metal because the higher the contact time the bacteria are unable to bind Cd metal because the bacteria have hemolysis (already die).

In Figure 5.The absorption of Cd metal with a density of 4 × 108 ml can be seen that the optimum time for absorption of Cd metal in bacteria occurs at 6 hours with an absorption concentration of 72.045% because at that time there is a balance between the functional groups of the absorption material that binds to the number of metal ion molecules in the solution and the bacteria are still able to bind Cd metal, while at the contact time of 12 hours, 24 hours and 48 hours the bacteria are unable to absorb Cd metal because the higher the contact time the bacteria are unable to bind Cd metal because the bacteria have hemolysis (already die).

CONCLUSION

Based on the results obtained from the research on the effectiveness of Pseudomonas fluorescens as an absorber of cadmium metal, it can be concluded: Pseudomonas fluorescens is an effective bacteria to absorb Cd metal. Based on the tests that have been carried out, it was found that the \\optimum density of Pseudomonas fluorescens in absorbing cadmium metal at a density of 4 × 108 / ml resulted in optimum bacterial binding which did not cause hemolytic bacteria to bind metals.

3.The optimum immersion conditions for the absorption of Cd metal in Pseudomonas fluorescens against a contact time of 6 hours with a

density of 4 × 108 / ml with an absorption capacity of 72.045%.

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