USE OF *LEPIRONIA ARTICULATA* (GREY SEDGE) FOR TREATMENT OF DOMESTIC HOUSEHOLD WASTEWATER

NURUL NAJIHAH BINTI ASHHARUDIN

B. ENG(HONS.) CIVIL ENGINEERING

UNIVERSITI MALAYSIA PAHANG

SUPERVISOR'S DECLARATION

I/We* hereby declare that I/We* have checked this thesis/project* and in my/our* opinion, this thesis/project* is adequate in terms of scope and quality for the award of the Bachelor Degree of Civil Engineering

____

(Supervisor's Signature)

Full Name : DR. MIR SUJAUL ISLAM

Position : Senior Lecturer

Date : 31 May 2019

STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

____

(Student's Signature)

Full Name : NURUL NAJIHAH BINTI ASHHARUDIN

ID Number : AA 15206

Date : 31 MAY 2019

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ABSTRAK

Air yang mengandungi sisa manusia, bahan kimia atau perindustrian boleh menyebabkan beberapa penyakit melalui penyerapan atau sentuhan. Antara penyakit yang berkaitan dengan air ialah cirit-birit, gastrik dan demam. Projek tahun akhir ini dikaji terutamanya mengenai penggunaan *Lepironia Articulata* untuk rawatan air sisa isi rumah domestik. Objektif kajian ini adalah untuk menganalisis air sisa yang dihasilkan daripada air kumbahan isi rumah domestik di Universiti Malaysia Pahang, kampus Gambang dan untuk menilai kesesuaian dan keberkesanan merawat efluen dengan menggunakan *Lepironia Articulata* dan bandingkan hasil dengan Malaysia Standard. Parameter kualiti air terpilih untuk kajian ini adalah pH, permintaan oksigen biokimia (BOD), permintaan oksigen kimia (COD), kekeruhan, pepejal terampai (TSS), minyak dan gris, kadmium, tembaga dan plumbum. Kesemua keputusan parameter ini dirujuk sebagai Akta Kualiti Alam Sekeliling, 1974. Eksperimen ini dijalankan dengan dua kaedah iaitu di tapak dan di makmal . Kaedah tapak dilakukan di tapak yang terletak di penghuni kolej kafeteria 1. Kaedah makmal telah dilakukan di Makmal Alam Sekitar FKASA, Universiti Malaysia Pahang. Sampel A yang mengandungi 100% air kumbahan dan tumbuhan. Sampel B 70% air kumbahan, 30% air suling dan tumbuhan. Sampel C mengandungi 50% air kumbahan, 50% air suling dan tumbuhan. Semua jumlah sampel adalah 10L. Setiap minggu data bagi setiap parameter telah diambil dan direkodkan. Selepas 3 minggu pemerhatian, peratusan penghapusan dikira. Menurut data, Sample C menunjukkan peratusan penyingkiran yang paling berkesan. Untuk pH, bacaan dari asid menjadi neutral. Ammonia-nitrogen dengan 100% peratusan penyingkiran, COD dengan 78.70%, BOD dengan 40% dan minyak dan gris dengan 67.85%. Akhir sekali, untuk logam berat, terdapat 3 jenis logam berat yang telah diperhatikan. Untuk plumbum dengan 81.13%, kadmium dengan 56.25% dan tembaga dengan 60.26%. Melalui kajian ini, hasilnya menunjukkan bahawa tumbuhan ini berkesan dalam merawat ammonia-nitrogen, plumbum dan tembaga kerana peratusannya lebih daripada 70%.

ABSTRACT

Water contaminated by human, chemical or industrial wastes can cause a number of diseases through ingestion or physical contact. Water-related diseases include diarrhea, gastric and fever. This final year project studied mainly about the use of *Lepironia Articulata* for treatment of domestic household wastewater. The objectives of this study were to analyse wastewater generated from a domestic household wastewater in University Malaysia Pahang, Gambang campus and to evaluate suitability and effectiveness of treating effluent by using *Lepironia Articulata* and compare the result with Malaysia Standard. The selected water quality parameter for this study were pH, biochemical oxygen demand (BOD), chemical oxygen demand (COD), turbidity, total suspended solids (TSS), oil and grease, cadmium, copper and lead. All of these parameters results were referred to as Environmental Quality Act, 1974. The experiment was conducted with two methods which are in-situ and ex-situ. The in-situ method was done at the site located in cafeteria college resident. Ex-situ was done at the FKASA Environment Laboratory, Universiti Malaysia Pahang. Sample A which contains 100% wastewater and plant. Sample B 70% wastewater, 30% distilled water and plant. Sample C contains 50% wastewater, 50% distilled water and plant. All the sample volume are 10L. Every week the data for every parameter was taken and recorded. After 3 weeks of observation, the percentage of removal were calculated. According to the data, Sample C shows the highest efficient removal percentage. For pH, the reading form acid become neutral, ammonia-nitrogen with 100%, COD with 78.70 %, BOD with 40% and oil and grease with 67.85%. Lastly, for heavy metal, there are 3 types of heavy metal that had been observed. For lead with 81.13%, cadmium with 56.25% and copper with 60.26%. Thru this study, the result shows that these plant is effective in treating ammonia-nitrogen, lead and copper since the percentage is more than 70%.

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%	Percent
µ	Micro
ºC	Celcius

LIST OF ABBREVIATIONS

BOD	Biochemical Oxygen Demand
Cd	Cadmium
COD	Chemical Oxygen Demand
Cu	Copper
NH_3 - N	Ammonia Nitrogen
OG	Oil and Grease
TSS	Total Suspended Solid

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Water is an important element in our live. Water is made up of billions of molecules. Each molecule is made of one oxygen and two hydrogen atoms held together by strong covalent bonds. There are three different form of water that can be found on earth, they are gas, solid, and liquid. Water flows as liquid in rivers, streams, and oceans, solid as ice and gas in the sky. Water is also underground and inside plants and animals. All living things need water in some form to survive on Earth. Water is an important resource with many uses including food production, cleaning, transportation, power generation, recreation, and more. Water is a vital natural resource for humans, being also essential for all ecosystems (Sousa et al. 2018).

Around the world, there is an increasing trend in areas of land, surface waters and groundwater affected by contamination from industrial, military and agricultural activities either due to ignorance, lack of vision, or carelessness. The build-up of toxic pollutants not only affects natural resources but also causes a major strain on ecosystems.

Phytoremediation is a process where various plant are used to eliminate contaminants directly from soil or water by itself. This process or what people called as bioremediation is an alternative way to eliminate the contaminants rather than using chemical treatment. Phytoremediation is an applicable technique to several reclaiming treatment, because it does not interfere with the ecosystem, it requires little manpower and therefore is not very expensive compared to traditional physicochemical methods. (Cristaldi et al. 2017)

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The “phytoremediation” process is a very promising and eco-friendly approach for heavy metal remediation from contaminated sites with some limitations (Kumar Yadav et al. 2018). Phytoremediation is the direct use of living green plants for in situ, removal, degradation, or containment of contaminants in soils, sludges, sediments, surface water and groundwater. Phytoremediation is a low cost, solar energy driven cleanup technique.

The word “remediation” can be classified by the organism involved such as bioremediation by microorganisms, or phytoextraction, phytovolatilisation, phytostabilisation, rhizofiltration and phytoremediation by plants (Placek et al., 2016). Now, researchers have engendered cost-effective and eco- friendly technologies that include the use of live plants for cleaning of contaminated sites (Kumar et al., 2017).

1.2 PROBLEM STATEMENT

The role and function of water in the ecosystem is to provide the support for the community. Water connects and maintains all ecosystems on the planet. The main function of water is to boost plant growth and to provide the nutrients and minerals necessary to sustain physical life. People also need water to survive. Water helps to transport oxygen, minerals, nutrients and waste products to and from the cells. The digestive system needs water to function properly, and water lubricates the mucous layers in the respiratory and gastrointestinal tracts.

The steady increase in population, together with the rapid utilization of resources and continuous development of industry and agriculture has led to excess amounts of wastewater with changes in its composition, texture, complexity and toxicity due to the diverse range of pollutants being present in wastewater.(Hlongwane et al. 2019). The urban population of the world has grown rapidly. 54% of the world's population (approximately 3.9 billion people) lived in urban areas in 2014, this proportion is expected to increase to 66% by the year 2050 (Jensen and Wu, 2018).

The important of wastewater treatment in the modern industrial world is very high in view of the fact that more than 97%, dormant in polar regions, of the available water is saline and 2% of the freshwater in unavailable for human consumption (Feroz et al.,2013). In this research we focus more on domestic wastewater since we used it in our daily life. Domestic wastewater is the water that has been used by a community and which contains all the materials added to the water during its use. It comes from washing, laundry, food preparation, household kitchen and toilets.

1.3 OBJECTIVE

- To analyse wastewater generate from domestic household in Universiti Malaysia Pahang Gambang campus.
- To evaluate suitability and effectiveness of treating effluence *by Lepironia Articulata* (grey sedge) and compare the result with Malaysia Standard.

1.4 SCOPE OF STUDY

- Take and analyse for sample of wastewater in domestic area in University Malaysia Pahang campus.
- The sample will be measure and analyse using parameters (biochemical oxygen demand (BOD), chemical oxygen demand (COD), pH, turbidity, total suspended solids (TSS), heavy metal, ammonia-nitrogen and oil and grease) where all the tests be held in Environmental Laboratory UMP.

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