A PERFORMANCE OF FERMENTED SOYBEAN IN WATER TREATMENT

MUHAMMAD AIMAN FIKRI
BIN MOHAMAD AZLAN

B. ENG (HONS.) CIVIL ENGINEERING

UNIVERSITI MALAYSIA PAHANG

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 : MUHAMMAD AIMAN FIKRI BIN MOHAMAD AZLAN

ID Number : AA15056

Date : 29th MAY 2019

A PERFORMANCE OF FERMENTED SOYBEAN IN WATER TREATMENT

MUHAMMAD AIMAN FIKRI BIN MOHAMAD AZLAN

Thesis submitted in fulfillment of the requirements
for the award of the
B. Eng (Hons.) Civil Engineering

Faculty of Civil Engineering and Earth Resources

UNIVERSITI MALAYSIA PAHANG

MAY 2019

ACKNOWLEDGEMENTS

Foremost, I would like to thank to Allah SWT for giving me strength and opportunity throughout in completing the research successfully. For my family who have supported me while I have been completing my research in terms of moral and finance. Especially my father, Mohamad Azlan bin Sabjan, who always give me a motivation and inspiration during my study and convinced me to complete my research.

Next, I would like to express my sincere gratitude to my supervisor, Hasmanie binti Abdul Halim for her guidance of my research, for her motivation and immense knowledge. Her effort to advise me in solving the problems either in laboratory works or writing thesis are invaluable. I am very fortunate to have benefited from the convergence of each of her unique expertise.

Then, I would like to thank to the staff of FKASA Enviromental lab that have assist in my research analysis in need of materials, guideline and instructions during the laboratory works process of my research.

Last but not least, also not forgetting to mention and thank to my fellow researchers who have provided extraordinary moral support, ideas and accompany which important in completing my research to ease my countless episodes of sufferings throughout the journey of the process. I appreciate all the advices and encouragement for everyone during the research.

ABSTRAK

Sungai ini mempunyai banyak kegunaan penting, sangat penting untuk kualitinya dipantau dan dikaji secara berterusan. Sekiranya sungai tidak dikekalkan, banyak kesan sampingan akan berlaku pada masa hadapan seperti pencemaran sungai. Pencemaran sungai mempengaruhi ekosistem sungai dan juga menyebabkan kualiti air yang buruk. Langkah-langkah untuk merawat air sungai perlu diambil agar kualiti air sungai sentiasa bersih. Oleh itu, objektif kajian ini adalah untuk menentukan Indeks Kualiti Air Sungai Belat (WQI) berdasarkan enam parameter dalam skop WQI, untuk mengklasifikasikan Sungai Belat berdasarkan WQI yang telah ditentukan dan membandingkan WQI di Sungai Belat dengan dan untuk melihat keberkesanan kaedah rawatan air sungai menggunakan serbuk soya yang ditapai. Kacang yang ditanam akan bertindak sebagai koagulan untuk proses pemberbukuan. Pemberbukuan akan melekatkan semua residu atau sedimen dalam sampel. Dan selepas itu, sampel dengan penapis untuk menghilangkan kotoran. Seterusnya, ujian untuk Indeks Kualiti Air akan dilakukan. Berdasarkan hasil kajian, nilai WQI untuk Sungai Belat adalah 79. Nilai ini diperolehi setelah mengambil kira sub-indeks dari enam parameter WQI yaitu Dilute Oxygen (DO), Permintaan Oksigen Biokimia (BOD) , Permintaan Oksigen Kimia (COD), Pepejal Digantung (TSS), Ammonia Nitrogen (AN) dan pH. Untuk penentuan klasifikasi Sungai Belat, nilai WQI telah ditunjukkan untuk menunjukkan Sungai Belat berada di bawah Kelas III. Kualiti air Sungai Belat pulih dengan serbuk kacang soya yang difermentasi sekarang lebih baik di mana nilai WQI adalah 91.7 dan berada di bawah Kelas II, sedikit ke Kelas I

ABSTRACT

The river has many important uses, it is very important for its quality to be monitored and reviewed continuously. If the river is not maintained, many adverse effects will occur in the future such as river pollution. River pollution affects river ecosystems and also causes poor water quality. Steps to treat river water should be taken so that the river's water quality will always be clean. Therefore, the objective of this study is to determine the River Belat Water Quality Index (WQI) based on the six parameters in the WQI scope, to classify the Belat River based on WQI which has been determined and to compare WQI in Belat River with and to see the effectiveness of river water treatment methods using fermented soy powder. Fermented soybean will acts a coagulant for the process of flocculation. Flocculation will stick all the residue or sediment in the sample. And after that, the sample with be filter in order to remove the dirt. Next, testing for Water Quality Index will be done. Based on the results of the study, the value of WQI for the Belat River is 79. This value is obtained after taking into account the sub-index of the six parameters of WQI ie Dilute Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Suspended Solids (TSS), Ammonia Nitrogen (AN) and pH. For the determination of the Belat River classification, the WQI value has been shown to indicate the Belat River is below Class III. The water quality of Belat River recovered with fermented soybean powder is better now where the WQI value is 91.7 and is below Class II, slightly to Class I.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

FAME	Fatty Acids Methyl Ester
JAS	Jabatan Alam Sekitar
DO	Dissolved Oxygen
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
TSS	Aluminium Trioxide
AN	Nitrogen Ammonia
DID	Drainage and Irregation Department
WQI	Water Quality Index
NWQS	National Water Quality Standard
FKASA	Fakulti Kejuruteraan Awam & Sumber Alam

CHAPTER 1

INTRODUCTION

1.1 Background of Study

River is a big stream of water that flows and extends continuously from upstream to downstream. The river has several small components prior to the formation of a long and large river. At the beginning of the early stages of the formation of rivers, springs will flow to creeks. Then several streams will flow towards the same place to merge into a big river.

River is also one of the elements in the hydrological cycle. The rivers flowing into the oceans will evaporate into the atmosphere as water vapor. Cold air in the atmosphere will cause water vapor to condense into water droplets, which eventually form clouds. When there is too much water content in the cloud, droplet of water falls to earth as rain. Rainwater that falls to Earth's surface will flow into the river and partly diffuse into the land known as the infiltration process.

Due to the many uses of the river, the river water quality is very important to be monitored and maintained. Good water quality is essential to all life stages (Mamun et al., 2013). River water quality can be measured using the Water Quality Index (WQI).WQI consists of six key parameters that can determine the level or class river called Dissolved Oxygen (DO), Index alkalinity or acidity (pH), Chemical Oxygen Demand (COD), Nitrogen Ammonia (AN), Biochemical Oxygen Demand (BOD) and Suspended Solids (SS), (Ma'arof et al., 2015). Parameters such as pH and DO can be

analyzed in a while parameters such as COD, AN, BOD and SS should be analyzed in the laboratory.

Environmental Quality Act (1974) defines pollution is a matter of changing the physical, thermal, chemical, and biological environment directly or indirectly by releasing waste to the detriment of the environment. The problem of pollution is not a new issue in Malaysia. Among the key factors that have been identified contributing to water pollution is the discharge of domestic wastewater from settlements (Bell, 1971). River pollution in the state of Johor has become more serious over time, and until now no longer appropriate solutions to help address the problem of pollution. Furthermore, what is more alarming is that this is not applicable pollution in the rivers of the urban areas, but also occurs in rivers rural areas. Water pollution will affect the quality and quantity of water supply and indirectly affect public health, industry, recreation, agriculture, fisheries, ecology and extinction system and biological diversity of aesthetic impairment (Rahman et al., 2001). The water quality of our rivers is declining due to several reasons such as domestic sewage wastes, sewage stars of livestock, land reclamation, land clearing, agriculture and manufacturing industries. This led to the deterioration of water quality and adverse impacts to humans, aquatic life and disrupts the food chain (Mazlin et al., 1999).

1.2 Problem Statement

River is contaminated through two main sources of pollution source dotted such as wastewater discharge from industrial areas and away from the sewage treatment plant, while the other is the pollution source is dotted as runoff from agricultural activities, housing, construction and others (DOE, 2013). Each influent flowing into the river will affect the quality of the river. About 70% of river pollution in Malaysia due to the unscrupulous activities by removing rubbish and waste discharge effluent (Star, 2006).

Among the causes of river pollution is the contamination point sources Belat River such as waste disposal plant from factories in the upstream areas. In addition, do not drip pollution sources also contributed to the pollution of the River Belat. Water discharge of squatter houses in the area around the river and orthophosphate content increases the concentration of Chemical Oxygen Demand (COD) in the stream. Various methods have been implemented and planning for conservation of the river to maintain water quality. Each method used shall be reviewed by study prior effectiveness. The method used should be appropriate to the circumstances and causes the origin of the river's pollution. The quality of river can be preserved by undergoing treatment to the river.

1.3 Objectives of the Study

The three objectives of this study are:

I. To identify the Water Quality of Belat River based on six parameters within the scope of WQI.
II. To determine the optimum dosage of fermented soybean powder that acts as coagulant.
III. To investigate the performance of fermented soybean powder by comparing of the WQI before and after treatment.

1.4 Scope of the Study

River water samples will be taken from several points that have been identified. Prior to this study, a visit to the river has been carried out for the purpose of observation of the state of the river and takes the coordinates for the location collecting sample.

This study focuses on six key parameters to determine the Water Quality Index (WQI) and which are Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrogen Ammonia (AN), Suspended Solids (TSS)

REFERENCES

Sunblad, K. Tonderski, K. and Rulewski (1994). Nitrogen and Phosphorus in the Vistula River, Poland, Water Science Technology, 30(5): 177-186.

Bell, H.L (1971). Effect of Low pH on Survival and Emergence of Aquatic Insect, Water Resource. 5: 313-319.

Mamun, A. a, and Zainudin, Z. (2013). Sustainable river water quality management in Malaysia. IIUM Engineering Journal, 14(1), 29–42.

Mohamed, M. (2008). Water Quality Models in River Management. 1st Technical Meeting of Muslim Water Researchers Cooperation (MUWAREC), 2008(December), 14–26.

Penn, M. R., Pauer, J. J., and Mihelcic, J. R. (n.d.). M ES PL C E O – PL C E O –, II.

Quality, W., On, O., Estuary, R., and Strait, E. T. (2015). Water Quality Observation on Johor River Estuary and East Tebrau Strait. Jurnal Teknologi 4, 29–32.

Zainudin, Z., Rahman, N. A., Abdullah, N., and Mazlan, N. F. (2010). Development of water quality model for sungai tebrau using QUAL2K. Journal of Applied Sciences.

Higa, T. & Chinen, N. 1998, 'EM Treatments of Odor, Waste Water, and Environmental Problems', College of Agriculture, University of Ryukyus, Okinawa, Japan.

Higa, T., & Parr, J. F. (1994). Beneficial and effective microorganisms for a sustainable agriculture and environment (Vol. 1). Atami,, Japan: International Nature Farming Research Center.

Alina Petre, MS, RD (CA) (2017). Why Natto Is Super Healthy and Nutritious

Tomodachi G7 Japan 2016. Bringing Safe Drinking Water to the World. We Are Tomodachi Autumn 2015

Noor Azwita binti Awang Besar (2009). Keberkesanan Penggunaan Microorganisma Efektif (Effective Microorganism-E.M) Dalam Pemuliharaan Sungai Belat. Bachelor Degree Thesis, Universiti Teknologi Malaysia, Skudai

Postel, S. and Richter, B. (2003). Rivers for life. Washington: Island Press.

Zakaria, Z., Gairola, S., and Shariff, N. M. (2010). Effective microorganisms (EM) technology for water quality restoration and potential for sustainable water resources and management. In Proceedings international congress on environmental modelling and software S (pp. 0-04).

Wahidah binti Wahid (2016). Improvement of Water Quality Using Effective Microorganism, Bachelor Degree Thesis, Universiti Teknologi Malaysia

Che Mohd Rosdan bin Che Rahim (2016). Keberkesanan Mikroorganisma Efektif untuk Meningkatkan Kualiti Air di Sungai Hiliran, Kuala Terengganu, Tesis Ijazah Sarjana Muda Kejuruteraan Awam, Universiti Teknologi Malaysia

David Ibekwe (2015). This powder separates dirt from water by sticking to it and making it sink. Business Insider

DOE (2004). The study on pollution prevention and water quality improvement of Sg. Melaka. Department of Environment Malaysia, Ministry of natural resources and environment Malaysia.

DOE (1994). Classification of Malaysian rivers. Final report on development of water quality criteria and standards for Malaysia (Phase IV – River Classification). Department of Environment Malaysia, Ministry of science, technology and the environment.

Chapman D. (1992). Water quality assessment. Chapman & Hall, London.