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The use of moringa olifera and mangifera india seeds as coagulants in coagulation-flocculation process for water treatment / Loke Min Hui.

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PERPUSTAKAAN SULTANAH NUR ZAHIRAH UMT

THE USE OF *Moringa oleifera* AND *Mangifera indica* SEEDS AS COAGULANTS  
IN COAGULATION-FLOCCULATION PROCESS FOR WATER TREATMENT

By  
LOKE MIN HUI

A PITA research report submitted in partial fulfillment of  
the requirements for the award of the degree of  
Bachelor of Technology (Environment)

SCHOOL OF OCEAN ENGINEERING  
UNIVERSITI MALAYSIA TERENGGANU  
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VERIFICATION AND APPROVAL FORM

This PITA research report entitled *The Use of Moringa oleifera and Mangifera indica Seeds As Coagulants in Coagulation-flocculation Process for Water Treatment* prepared and submitted by Loke Min Hui Matric No. UK29499 in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology (Environment) has been examined and is recommended for approval of acceptance.

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## DECLARATION

I hereby declare that this PITA research report entitled The Use of *Moringa oleifera* and *Mangifera indica* Seeds as Coagulants in Coagulation-Flocculation Process for Water Treatment is the result of my own research except as cited in the references.

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Always in my heart.

# THE USE OF *Moringa oleifera* and *Mangifera indica* SEEDS AS COAGULANTS IN COAGULATION-FLOCCULATION PROCESS FOR WATER TREATMENT

## ABSTRACT

The use of Alum as coagulant can bring long term or short term negative effects to human due to the residue of Alum in treated water. Therefore, natural coagulant and coagulant aid should be used to replace the chemical coagulants. In this research, seeds of *Moringa oleifera* and *Mangifera indica* were chosen as natural coagulant and coagulant aid respectively in order to replace chemical coagulants. The objectives were to characterize *Moringa oleifera* and *Mangifera indica* seed in terms of their surface morphology by using Scanning Electron Microscope (SEM), the presence of functional groups by using Fourier Transform-Infrared Spectroscopy (FTIR) and their surface area by using Brunauer, Emmett and Teller (BET). The second objective was to determine the optimum dosage and pH of *Moringa oleifera* and *Mangifera indica* seeds in coagulation process. The *Moringa oleifera* seed had spherical structure with small pores on surface while *Mangifera indica* seed appeared as an irregular granule unit with rough surface. Functional groups that present in *Moringa oleifera* seed were amine and hydroxyl groups due to the presence of protein while for *Mangifera indica* were aldehyde and hydroxyl groups due to the presence of starch. The BET surface area of *Moringa oleifera* was larger than *Mangifera indica*. The optimum dosages of *Moringa oleifera* and *Mangifera indica* were determined by using jar test. Three main parameters that were being studied were turbidity, Total Suspended Solid and pH of synthetic turbid water. The optimum dosage of *Moringa oleifera* and *Mangifera indica* were 60 mg/L and 40 mg/L respectively at optimum pH of 4 with highest turbidity removal of 74.13%. The optimum dosage of Alum was 300 mg/L while the optimum dosage of *Mangifera indica* at 100 mg/L dosage of Alum was 60 mg/L. The highest turbidity removal efficiency occurred at pH 3 with 92% of turbidity removal.



# PENGUNAAN BIJI BENIH *Moringa oleifera* DAN *Mangifera indica* SEBAGAI BAHAN PENGUMPAL DALAM PROSES PENGUMPALAN DAN PENGELOMPOKAN UNTUK RAWATAN AIR

## ABSTRAK

Pengunaan Alum sebagai bahan pengumpul boleh membawa kesan negative secara jangka panjang atau pendek kepada manusia akibat daripada sisa Alum dalam air yang telah dirawat. Oleh itu, bahan pengumpul dan bantuan bahan pengumpul semula jadi boleh digunakan untuk menggantikan pengental bahan kimia. Dalam kajian ini, benih *Moringa oleifera* dan *Mangifera indica* telah dipilih sebagai bahan pengumpul dan bantuan bahan pengumpul. Objektif kajian ini adalah untuk mencirikan sifat benih *Moringa oleifera* dan *Mangifera indica* dari segi morfologi permukaan dengan mikroskop electron imbasan (SEM), kehadiran kumpulan berfungsi dengan menggunakan *Fourier Transform-Infrared Spectroscopy* (FTIR) dan keluasan permukaan mereka dengan menggunakan *Brunauer, Emmett and Teller* (BET), untuk menentukan dos dan pH yang paling baik bagi benih *Moringa oleifera* dan *Mangifera indica* dalam proses pengumpulan. Benih *Moringa oleifera* mempunyai struktur sfera dengan terdapatnya liang kecil di permukaan manakala benih *Mangifera indica* muncul sebagai unit bijian yang tidak sekata dengan permukaan yang kasar. Kumpulan berfungsi yang hadir dalam benih *Moringa oleifera* adalah kumpulan amina dan hidroksil yang disebabkan oleh kewujudan protein manakala kumpulan aldehid dan hidroksil terdapat dalam benih *Mangifera indica*, disebabkan oleh kehadiran kanji. Keluasan Permukaan BET bagi *Moringa oleifera* adalah lebih besar daripada *Mangifera indica*. Dos optima *Moringa oleifera* dan *Mangifera indica* telah ditentukan dengan menggunakan ujian balang. Tiga parameter utama yang dikaji ialah kekeruhan, pepejal terampai dan pH air keruh sintetik. Dos yang terbaik bagi *Moringa oleifera* dan *Mangifera indica* adalah 60 mg/L dan 40 mg/L masing-masing pada pH 4 dengan kecekapan penyingkiran kekeruhan yang paling tinggi, iaitu 74.13%. Dos yang terbaik bagi Alum adalah 300 mg/L manakala bagi *Mangifera indica* adalah 60 mg/L pada 100 mg/L dos Alum. Kecekapan penyingkiran kekeruhan yang tertinggi berlaku pada pH 3 dengan 92% penyingkiran kekeruhan.