

BIOSYNTHESIS OF
POLYHYDROXYALKANOATE BY *Vibrio spp.*
USING RENEWABLE RESOURCES

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FINAL YEAR PROJECT REPORT VERIFICATION

PENGAKUAN DAN PENGESAHAN LAPORAN

It is hereby declared and verified that this project report titled **Biosynthesis of Polyhydroxyalkanoate by *Vibrio spp.* Using Renewable Resources** by **Lim Xiu Ji, (UK30744)** have been examined and all errors identified have been corrected. This report is submitted to the School of Marine and Environmental Sciences as partial fulfillment towards obtaining the **(Bachelor of Marine Science)** from School of Marine and Environmental Sciences, University Malaysia Terengganu.

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DECLARATION

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LIST OF ABBREVIATION

| | | |
|---|---|-------------------------------------|
| KH_2PO_4 | : | Potassium dihydrogen phosphate |
| Na_2HPO_4 | : | Disodium hydrogen phosphate |
| NH_4Cl | : | Ammonium chloride |
| $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ | : | Magnesium sulphate heptahydrate |
| HCl | : | Hydrochloric acid |
| $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ | : | Iron(II) sulfate heptahydrate |
| $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$ | : | Manganese(II) chloride tetrahydrate |
| $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$ | : | Cobalt(II) Sulfate Heptahydrate |
| $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ | : | Calcium Chloride Dihydrate |
| $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$ | : | Copper(II) chloride dihydrate |
| $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ | : | Zinc sulfate heptahydrate |
| Na_2SO_4 | : | Sodium sulfate |
| N | : | Normality |
| g/L | : | Gram per litre |
| %(w/w) | : | Percentage of weight per volume |

v/v : Volume per volume
w/v : Weight per volume
mg : Milligram

ABSTRACT

Polyhydroxyalkanoate (PHA) is a type of biodegradable plastics which can be synthesized by bacteria under limited nutrient and excess of carbon source. Three *Vibrio spp.* were used for PHA production which were *Vibrio alginolyticus*, *Vibrio parahaemolyticus* and *Vibrio harveyi*. In this study, five renewable and cheap carbon sources were used for PHA production, namely molasses and sweetwater from sugar cane refinery by-products, glycerol and glycerine pitch from oleochemical wastes industry and lastly roselle wastes from roselle extraction industry to cut down the cost production. Results showed that only *V. alginolyticus* is able to produce trace amount of Poly-3-hydroxybutyrate, P(3HB), with the P(3HB) content of $3.57 \pm 1.89\%$ (w/w) by using glycerine pitch as carbon source. All other strains with different carbon sources showed negative result on production of PHA.

Biosintesis polyhydroxyalkanoate oleh *Vibrio spp.* daripada sumber yang boleh diperbaharui.

ABSTRAK

Polyhydroxyalkanoate (PHA) adalah sejenis plastik yang boleh dilupuskan dalam alam sekitar yang boleh dihasilkan oleh bakteria apabila dalam keadaan nutrien yang dihadkan dan sumber karbon yang berlebihan. Tiga *Vibrio spp.* telah digunakan untuk menghasilkan PHA iaitu *Vibrio alginolyticus*, *Vibrio parahaemolyticus* dan *Vibrio harveyi*. Dalam kajian ini, lima sumber karbon yang telah digunakan dalam kajian ini untuk menghasilkan PHA ialah karbon *molasses* dan *sweetwater* daripada kilang penapisan gula, gliserol dan *glycerine pitch* daripada sisa oleokimia dan bahan buangan roselle daripada industri pengekstrakan roselle untuk mengurangkan kos penghasilan PHA. Keputusan menunjukkan hanya *V. alginolyticus* mampu menghasilkan jumlah P(3HB) yang kecil, $3.57 \pm 1.89\%$ (w/w) dengan menggunakan gliserin sebagai sumber karbon. Manakala bakteria yang lain tidak menghasilkan PHA apabila diuji dengan sumber karbon yang lain.