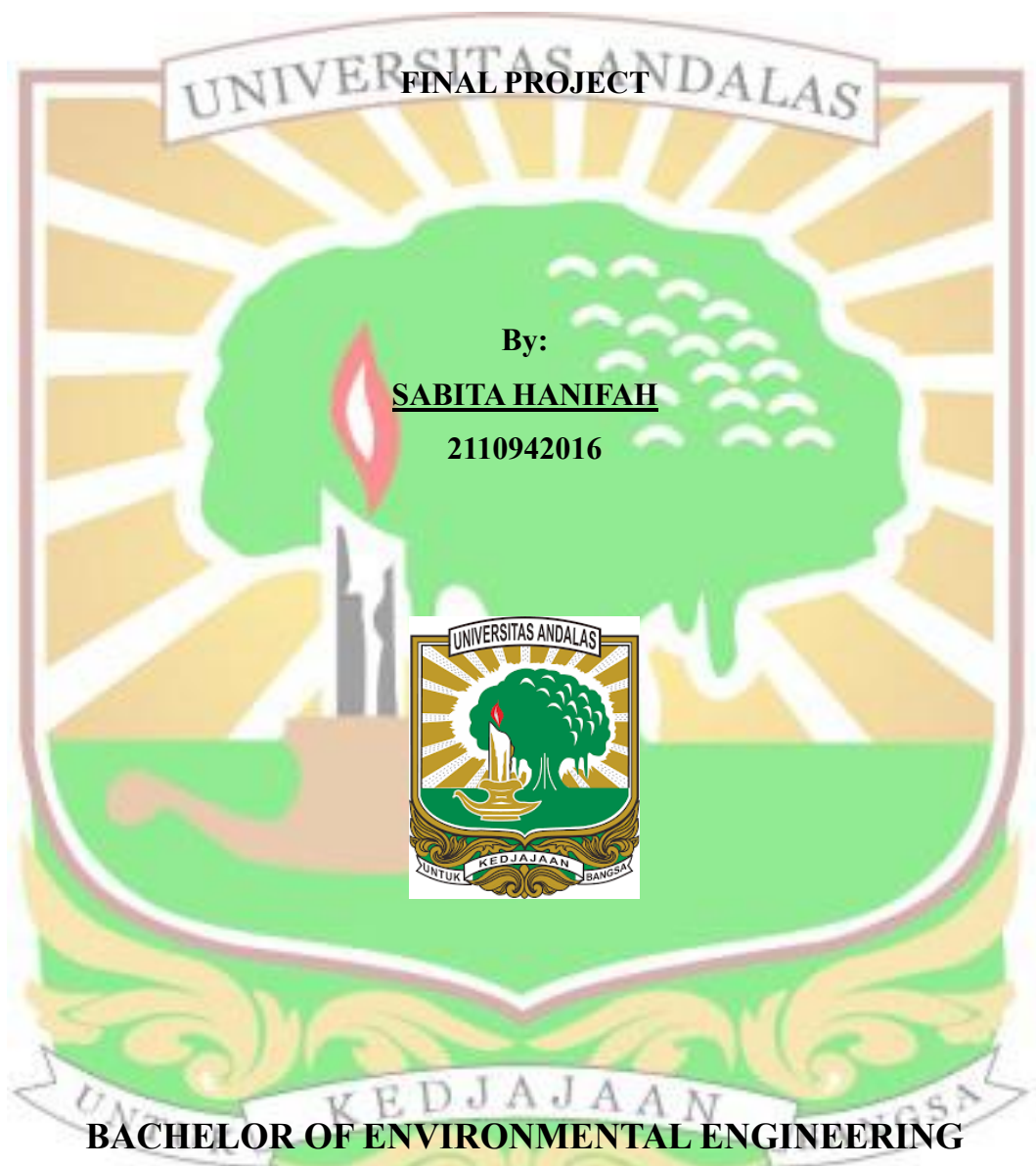


**IDENTIFICATION OF NITRIFYING BACTERIA IN  
UNTREATED PALM OIL MILL EFFLUENT DIGESTATE  
(POMED®) AND ITS NITRIFICATION POTENTIAL FOR  
AGRICULTURAL APPLICATION**



**FINAL PROJECT**

**By:**

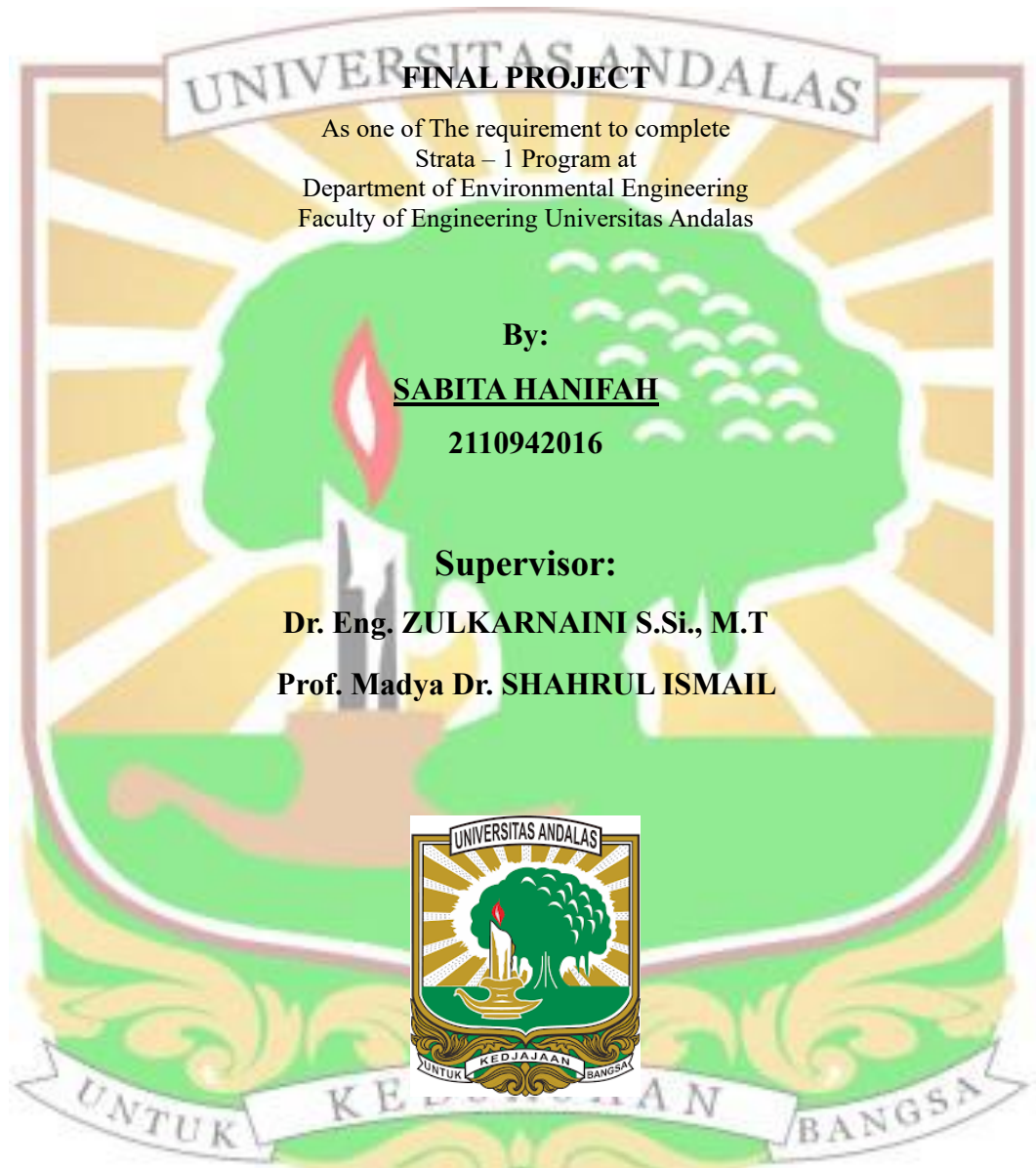
**SABITA HANIFAH**

**2110942016**



**BACHELOR OF ENVIRONMENTAL ENGINEERING  
DEPARTMENT OF ENVIRONMENTAL ENGINEERING  
FACULTY OF ENGINEERING – UNIVERSITAS ANDALAS  
PADANG  
2025**

**IDENTIFICATION OF NITRIFYING BACTERIA IN  
UNTREATED PALM OIL MILL EFFLUENT DIGESTATE  
(POMED®) AND ITS NITRIFICATION POTENTIAL FOR  
AGRICULTURAL APPLICATION**



**BACHELOR OF ENVIRONMENTAL ENGINEERING  
DEPARTMENT OF ENVIRONMENTAL ENGINEERING  
FACULTY OF ENGINEERING – UNIVERSITAS ANDALAS  
PADANG  
2025**

## ABSTRACT

Biological treatment ponds for palm oil mill effluent produce a by-product, Palm Oil Mill Effluent Digestate (POMED<sup>®</sup>). Mills usually store POMED<sup>®</sup> in dumping ponds to produce treated POMED<sup>®</sup>. The rainy season usually causes overflow problems in dumping ponds. This study aims to evaluate the use of untreated POMED<sup>®</sup> as a bio-organic fertiliser by identifying nitrifying microbes, measuring its nitrification capacity, and assessing its effects on soil chemical properties (pH and C/N Ratio). 16S rRNA gene sequencing profiled the nitrifying microbial community of untreated POMED<sup>®</sup>. Soil incubation experiments were conducted for 14 days with four treatments: control (T1), half dose of POMED<sup>®</sup> (T2), normal dose of POMED<sup>®</sup> (T3), and urea fertiliser (T4). Nitrification potential was measured according to ISO 15685:2012, and changes in inorganic nitrogen (Total Ammonia Nitrogen, NO<sub>2</sub><sup>-</sup>, NO<sub>3</sub><sup>-</sup>), pH, and C/N ratio underwent analysis. The microbial profile showed a diverse community in untreated POMED<sup>®</sup>, with *Nitrosomonas* identified as the AOB (0.128% relative abundance) and *Nitrospina* as NOB (0.020%). In T3, nitrate (NO<sub>3</sub><sup>-</sup>) and TAN concentrations increased by 19.32% and 33.36%, respectively, and ammonia and nitrate oxidation rates were higher than in the control. However, the application of untreated POMED<sup>®</sup> also caused soil acidification with a decrease in pH from 6.9 to 5.0 due to nitrification and a high C/N ratio (43-77), indicating the potential for microbial nitrogen immobilisation.

**Keyword:** Bio-organic fertilizer, nitrifying microorganisms, nitrification, POMED

