



Zabool University
Department of Agronomy

Presented in partial fulfillment of the requirements for Ph.D degree

Title:

**Effect of vermicompost, cow manure, rice residual and
Azolla integrated with plant growth promoting
rhizobacteria on yield and some ecophysiological
characteristics of rice**

Supervisor:

Dr. Alireza Siroosmehr

Advisors:

Dr. Mohammad Hossein Ansari

Dr. Ahmad Ghanbari

Author:

Mehdi Ghadimi

September 2021

ABSTRACT

A field experiment was conducted in a paddy soil in 2018-2017 for investigating the effect of vermicomposting of cow manure mixture with *Azolla* and rice straw on soil microbial activity, nutrient uptake and grain yield under inoculation of N₂-fixing bacteria. Experimental factors consisted of organic amendments in six levels (vermicomposts prepared from manure (VM); manure + rice straw (VRM); manure + *Azolla* mixture (VAM); manure + rice straw + *Azolla* mixture (VRAM); raw manure without vermicomposting (M) and a control) and N₂-fixing bacteria in three levels (*Azotobacter chroococcum*, *Azospirillum brasilense* and non-inoculation). The results showed that vermicompostic treatments compared to control and raw manure significantly increased the number and biomass-C of soil microorganisms, urease activity, number of tillers hill⁻¹, phosphorus (P) and potassium (K) uptake, and grain and protein yield. Inoculation of plants with N₂-fixing bacteria, especially *Azotobacter*, increased the efficiency of organic amendments, so that the maximum urease activity, soil microbial activity, P and N uptake and grain yield (4667 (2017) and 5081 (2018) kg ha⁻¹) were observed in vermicompost treatments containing *Azolla* (VAM and VRAM) under inoculation with *Azotobacter*. The results suggest that an organic source for vermicompost has a great effect on enzyme activity, soil biology, nutrient uptake and grain yield, by inoculation with appropriate N₂-fixing bacteria, has a synergistic interaction on agronomic traits under flooded conditions. Therefore, this nutrient method can be used as one of the nutrient management strategies in the sustainable rice production.

Key words: *Azolla*; cow manure; grain yield; microbial activity; paddy soil.