UNIVERSITI TEKNOLOGI MARA

ENHANCING OIL PALM EMPTY FRUIT BUNCH (EFB) COMPOST BY ADDITION OF BURNT RICE HUSK AS CARRIER MATERIAL FOR SELECTED NITROGEN-FIXING BACTERIA IN MUNCHONG SOIL SERIES

SYAFINA FASYA BINTI SAIFUL ANUAR

Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science
(Agronomy)

Faculty of Plantation and Agrotechnology

July 2019

ABSTRACT

The current interests in reducing the application of chemical fertilizers and the increasing demand for combined effects of microorganisms with agro-waste materials are perceived to give positive impact on soil, crop productivity and sustainable agriculture. The aims of this study were to prepare a series of combinations of empty fruit bunch compost (EFBC) with burnt rice husk (BRH) as carrier materials for selected nitrogen-fixing bacteria, evaluate their suitability and determine the ability of the inoculated EFBC-BRH carrier materials to amend the Munchong soil series. Different ratios of EFBC and BRH were used to prepare the carrier materials for the selected N_2-fixing bacteria namely, *Bacillus* spp strains Sb35 and Sb42. Both coarse and fine EFBC were used in the preparations. The suitability of the EFBC-BRH combinations as carrier materials were tested by inoculating the different carrier materials combinations with the N_2-fixing bacteria and incubated at room temperature for eight weeks after which, the effects on bacteria population, pH, moisture content and contaminants were determined. The ability of the inoculated carrier materials to amend the Munchong soil series was evaluated by carrying out a glasshouse pot experiment for 30 days. The effects on the bacteria population, soil pH, soil bulk density, cation exchange capacity (CEC) and total nitrogen (N) were determined at 0 day and 10, 20 and 30 days after amendment. The results showed that the fine textured EFBC-BRH carrier materials combinations (T5, T6, T7 and T8) were better carrier materials compared to the coarse textured EFBC-BRH carrier materials combinations (T1, T2, T3 and T4). The T6 (1 fine textured EFBC: 1 BRH) inoculated carrier material showed the best response with Sb35 and Sb42 population increasing by 7.34% and 7.47% respectively. The T6-Sb35 and T6-Sb42 inoculated carrier materials did not have any significant effect on soil pH but a reduction of 47.8 % and 52.6 % respectively in soil moisture was observed after eight weeks of incubation period. Glasshouse pot experiments for soil amendment showed that T6 inoculated with Sb42 was approximately 6 % higher in population. The CEC, soil pH, soil total N and bulk density for T6-Sb42 increased by 27.6 %, 24.9 %, 43.53 % and 3.23 % respectively after 30 days as compared to other treatments and control. In conclusion, the T6-Sb42 has the potential to be developed as biofertilizer.

ACKNOWLEDGEMENT

First of all I thank Almighty Allah for giving me good health, strength and perseverance. I would like to pay my deep regards and compliments to my supervisor, Associate Professor Dr. Adzmi Yaacob, for his dedicated advice and guidance in the planning experiments and preparation of thesis. I am greatly indebted for his constructive criticizing and patience.

I owe my most sincere gratitude to my supervisory committee, Associate Professor Dr. Radziah Othman for her encouragement, suggestions, guidance and invaluable support towards my research.

I wish to express many thanks to the staff of Soil Microbiology Laboratory, Department of Land Management, Faculty of Agriculture, UPM for their extensive cooperation, kind assistance and equipment provided for laboratory and glasshouse studies.

Special thanks to staff of Soil Science Laboratory, Faculty of Plantation and Agrotechnology, UiTM for their assistance.

I would like to extend my deepest gratitude and love are also due to members of family, my beloved parents, Saiful Anuar bin Safian and [redacted] and beloved siblings; Nurulaina Fasya, Mohd Hafizul, Suhaifaniza Fasya and Noratiqah Fasya who stood by me during trial and turbulence of this study.

My thanks to all my colleagues for their friendship, full support and kind assistance. Finally I would like to extend my deepest appreciation to all who have contributed in one way or another to the completion of this thesis.

TABLE OF CONTENTS