

UNIVERSITI TEKNOLOGI MARA

**THE EFFECTS OF
BIOCHAR FERTILIZER
TREATMENT COMBINATIONS ON
GROWTH, BIOMASS PRODUCTION,
PARTITIONING AND NUTRIENT
UPTAKE OF MR 253 RICE VARIETY
GROWN UNDER AEROBIC
CONDITION**

ISHAM SAMEER BIN MD YUSOF

MSc

December 2020

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student : Isham Sameer Bin Md Yusof
Student I.D. No. : 2015233756
Programme : Master of Science (Agronomy) – AT732
Faculty : Plantation and Agrotechnology
Dissertation Title : The Effects Of Biochar-Fertilizer Treatment Combinations On Growth, Biomass Production, Partitioning And Nutrient Uptake Of MR 253 Rice Variety Grown Under Aerobic Condition
Signature of Student : *sameer*
Date : December 2020

ABSTRACT

The aerobic rice system in Malaysia generally produced lower crop yield compared to the normal conventional flooded rice system. One promising approach to address low yield is through increasing soil fertility and available nutrients, and soil biochar application can play that role. Biochar has been shown to increase in carbon sequestration, soil fertility and crop yield. However, the effects of biochar on physicochemical properties of specific soil and subsequent crop growth and yield performance of aerobic rice have not been thoroughly investigated. The objective of the study was to characterize physical and chemical properties of rice straw biochar and subsequent effects on growth and development of MR 253 rice variety grown under aerobic condition with various biochar-fertilizer treatment combinations. The field experiment was conducted from August 2016 to January 2017 at UiTM Melaka Jasin campus. They were five treatment combinations consisting of three biochar levels (0, 2.5 and 12.5 t/ha) and recommended fertilizer (full or half rates) application, arranged in a randomized complete block design (RCBD) with three replications. In addition to soil physicochemical properties, performance of MR 253 was evaluated based on growth, nutrient content, physiological performance and yield at both panicle initiation (63 DAS) and maturation (112 DAS) stages. Among biochar-fertilizer treatment combinations, the high biochar rate coupled with full recommended fertilizer rate (B.high-F.full), significantly improved soil chemical properties such as pH, CEC, and EC as well as nutrient contents of soil and various plant parts compared to the control throughout the cropping period. However, the positive effects of combination treatments on biomass production, partitioning and physiological response were only observed at the panicle initiation stage, while the highest yield enhancement of 656.57 g/m², was obtained at low biochar rate applied with half recommended fertilizer rate (B.low-F.half). The MR 253 response to combination of biochar-fertilizer treatments were generally high under high biochar combined with full fertilizer as reflected in plant nutrient contents as the result of improved soil properties caused by soil biochar incorporation. Yield was significantly improved with biochar-fertilizer combination treatments regardless of biochar levels and fertilizer rates as compared to the control.

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