

Effect of inorganic fertilizer application on soil microbial diversity in an oil palm plantation

ABSTRACT

Excessive fertilizer applications in oil palm plantations are conventionally done to increase the oil yield, but they result in high production cost and environmental pollution. There have been only separate reports on the effects of fertilizer application on soil physical, chemical characteristics, and microbial biodiversity. Therefore, this study was conducted to determine the correlation between soil characteristics and soil microbial biodiversity in oil palm plantation after long-term frequent chemical fertilizer application compared with secondary soil, using molecular methods of polymerase chain reaction denaturing gradient gel electrophoresis (PCR-DGGE) and MiSeq. Secondary forest soil was chosen as the control. The results showed that after 25 years of fertilizer application, the total nitrogen and organic carbon contents decreased from low to very low scale, indicating soil infertility condition. Reduction of Firmicutes was related to suppression of soil borne diseases, and Bacteroidetes which is an indicator of soil health were both almost eliminated after 25 years of fertilizer application. In conclusion, long-term inorganic fertilizer application reduced the soil nitrogen, and organic carbon, altered beneficial microbes in the soil.

Keyword: Firmicutes; Bacteroidetes; Inorganic fertilizer application; Oil palm plantation; Soil microbial biodiversity